Survey and Analysis of Plant Community Types
of
Writing-on-Stone Provincial Park

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FINAL REPORT

Prepared for

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Resource Data Branch
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ABSTRACT

Identification and monitoring of biological diversity in Alberta is the primary mandate of Alberta Natural Heritage Information Centre (ANHIC). A fundamental strategy in the preservation of functional ecosystems is to identify and preserve a full compliment of habitat types, which in return support a diversity of animals, plants, and other life forms. Vegetation is an integral component of habitat and provides a relatively easy means of inventory and monitoring of ecosystem health both spatially and temporally.

The current study, in Writing-on-Stone Provincial Park, focuses on the identification of unique riparian and coulee plant associations, or plant community type. The study area is situated approximately 8 km north of the USA border and 40 km east of the town of Milk River and occurs at the interface between the Mixedgrass and Dry Mixedgrass Natural Subregions. Priority research is currently required to address gaps in the identification, description and distribution of plant associations within the coulee and riparian zones of these Subregions. Many of these communities recur over the landscape but may occur as very small patches of $1 m^2$ or less. Alberta Sustainable Resource Development (ASRD) Resource Data Division contracted Wildlands Ecological to complete an inventory of natural/semi-natural plant communities, statistically analyse the data, and describe potential plant community or association types. The inventory and description of plant associations followed provincial standards and guidelines established by the International Classification of Ecological Communities (Grossman et al. 1998) and The Ecological Society of America (Jennings et al. 2003). The identified plant associations were then rated for similarity to other published plant associations according to previous applications by Corns (1983) and Strong (2002).

A total of 88 detailed plots were completed resulting in the identification of 52 potential plant associations. These included 32 previously described plant associations and 20 potentially new or tentative plant associations. Within the previously described plant association group there are 4 Woodland, 10 Shrubland and 18 Herbaceous Vegetation Association types. Descriptions under the tentative plant association group include 1 Woodland, 7 Shrubland, 11 Herbaceous Vegetation, and 1 Sparse Vegetation Type. A common theme throughout the study area was the significant extent of invasive disturbance-increaser plant species. This was especially apparent in the riparian zone and on heavily grazed land. Heavily disturbed areas were avoided and sampling was directed solely towards the identification of natural and semi-natural plant communities. Regardless of this sampling intent, the majority of plots included non-native or invasive disturbance-increasers. Another observation was the wealth of potential plant associations within the riparian zone and coulees. Many of the potential new types were described by only one plot and additional research is recommended to better describe these.

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Table of Contents

ABSTRACT iii
Acknowledgements iv
Table of Contents v
List of Tables vii
List of Figures vii
List of Appendices vii

1.0 INTRODUCTION 1
  1.1 Objectives 1
  1.2 Study Area 2

2.0 METHODS 4
  2.1 Data Collection 4
  2.2 Data Analysis 4
  2.3 Reporting 5
    2.3.1 Vegetation Classification System 5
    2.3.2 Floristic Unit Classification Confidence Level 6
    2.3.2 Provincial Conservation Rankings 6

3.0 RESULTS and DISCUSSION 8
  3.1 Field Program 8
  3.2 EXISTING CLASSIFICATIONS 9
    3.2.1 WOODLAND 9
      3.2.1.1 Populus deltoides / Glycyrrhiza lepidota Woodland 9
      3.2.1.2 Populus angustifolia / Symphoricarpos occidentalis Woodland 10
      3.2.1.3 Populus angustifolia / Cornus sericea Woodland 11
      3.2.1.4 Populus balsamifera / Symphoricarpos occidentalis Woodland 12
    3.2.2 SHRUBLAND 14
      3.2.2.1 Betula occidentalis Shrubland 14
      3.2.2.2 Shepherdia argentea Shrubland 15
      3.2.2.3 Elaeagnus commutata Shrubland 16
      3.2.2.4 Prunus virginiana Shrubland 17
      3.2.2.5 Amelanchier alnifolia Shrubland 18
      3.2.2.6 Arctostaphylos uva-ursi Dwarf-shrubland 19
      3.2.2.7 Salix exigua Shrubland 20
      3.2.2.8 Salix amygdaloides Shrubland 21
      3.2.2.9 Salix lutea - Cornus sericea Shrubland 22
      3.2.2.10 Symphoricarpos occidentalis Shrubland 23
    3.2.3 HERBACEOUS VEGETATION 25
      3.2.3.1 Artemisia cana / Stipa viridula - Pascopyrum smithii Shrub Herbaceous Vegetation 25
      3.2.3.2 Artemisia cana / Hesperostipa comata Shrub Herbaceous Vegetation 26
      3.2.3.3 Phalaris arundinacea Herbaceous Vegetation 27
      3.2.3.4 Calamagrostis stricta - Calamagrostis inexpansa Herbaceous Vegetation 29
      3.2.3.5 Glycyrrhiza lepidota Herbaceous Vegetation 31
      3.2.3.6 Hordeum jubatum Herbaceous Vegetation 32
      3.2.3.7 Schoenoplectus pungens Herbaceous Vegetation 33
      3.2.3.8 Juncus balticus Herbaceous Vegetation 35
      3.2.3.9 Calamovilfa longifolia - Hesperostipa comata Herbaceous Vegetation 36
      3.2.3.10 Pascopyrum smithii - Bouteloua gracilis Herbaceous Vegetation 37

3.2.3.11 Pascopyrum smithii - Hesperostipa comata - Bromus tectorum Herbaceous Vegetation 38
3.2.3.12 Pascopyrum smithii Herbaceous Vegetation 39
3.2.3.13 Pascopyrum smithii - Glycyrrhiza lepidota Herbaceous Vegetation 40
3.2.3.14 Hesperostipa comata - Bouteloua gracilis - Herbaceous Vegetation 41
3.2.3.15 Hesperostipa comata - Pascopyrum smithii - (Poa sandbergii) Herbaceous Vegetation 44
3.2.3.16 Elymus lanceolatus - Pascopyrum smithii Herbaceous Vegetation 45
3.2.3.17 Elymus lanceolatus - Hesperostipa comata Herbaceous Vegetation 46
3.2.3.18 Elymus trachycaulus Herbaceous Vegetation 47
3.3 TENTATIVE CLASSIFICATIONS 50
3.3.1 WOODLAND 50
3.3.1.1 Populus x acuminata / Symphoricarpos occidentalis Woodland 50
3.3.2 SHRUBLAND 51
3.3.2.1 Sarcobatus vermiculatus - Atriplex nuttallii / Distichlis spicata Dwarf-shrubland 51
3.3.2.2 Ericameria nauseosa - Gutierrezia sarothrae / Koeleria macrantha Dwarf-shrubland 52
3.3.2.3 Toxicodendron radicans Shrubland 54
3.3.2.4 Rhus trilobata - Artemisia cana / Hesperostipa comata Shrubland 55
3.3.2.5 Symphoricarpos occidentalis / Elymus piperi Shrubland 57
3.3.2.6 Juniperus communis - Artemisia cana Shrubland 58
3.3.2.7 Juniperus horizontalis - (Festuca scabrella) Dwarf-shrubland 60
3.3.3 HERBACEOUS VEGETATION 61
3.3.3.1 Festuca scabrella Herbaceous Vegetation 61
3.3.3.2 Alopecurus aequalis - Glycyrrhiza lepidota - Helianthus nuttallii Herbaceous Vegetation 62
3.3.3.3 X Agrohordeum Herbaceous Vegetation 65
3.3.3.4 Helianthus nuttallii Herbaceous Vegetation 65
3.3.3.5 Distichlis spicata - Iva axillaris Herbaceous Vegetation 66
3.3.3.6 Bouteloua gracilis - Poa sandbergii Herbaceous Vegetation 67
3.3.3.7 Krascheninnikovia lanata -Elymus lanceolatus - Hesperostipa comata Herbaceous Veg. 68
3.3.3.8 Hesperostipa comata - Aristida longiseta - Carex filifolia Herbaceous Vegetation 69
3.3.3.9 Achnatherum hymenoides - Hesperostipa comata Herbaceous Vegetation 72
3.3.3.10 Distichlis spicata - (Koeleria macrantha) - (Stipa viridula) Herbaceous Vegetation 73
3.3.3.11 Muhlenbergia cuspidata - Hesperostipa comata Herbaceous Vegetation 75
3.3.4 SPARSE VEGETATION 76
3.3.4.1 Distichlis spicata - Gutierrezia sarothrae Badlands Sparse Vegetation 76

4.0 LITERATURE CITED 79

APPENDICES 82

List of Tables

Table 1. Provincial plant community conservation ranking guidelines (Allen 2003). 7

List of Figures

Figure 1. *Salix lutea - Cornus sericea* Shrubland located in the Milk River riparian zone............................ 24
Figure 2. *Symphoricarpos occidentalis* Shrubland located in the Milk River riparian zone.......................... 24
Figure 3. *Artemisia cana / Stipa viridula - Pascopyrum smithii* Shrub Herbaceous Vegetation type............ 28
Figure 4. *Artemisia cana / Hesperostipa comata* Shrub Herbaceous type.. 28
Figure 5. *Phalaris arundinacea* Herbaceous Vegetation type. 30
Figure 6. *Calamagrostis stricta – Calamagrostis inexpansa* Herbaceous Vegetation type. 30
Figure 7. *Glycyrrhiza lepidota* Herbaceous Vegetation type located along Police Creek.............................. 34
Figure 8. *Schoenoplectus pungens* Herbaceous Vegetation type. 34
Figure 9. *Calamovilfa longifolia - Hesperostipa comata* Herbaceous Vegetation type................................. 43
Figure 10. *Hesperostipa comata - Bouteloua gracilis* Herbaceous Vegetation type. 43
Figure 11. *Hesperostipa comata - Pascopyrum smithii – Koeleria macrantha* Herbaceous Vegetation type. 49
Figure 12. *Elymus lanceolatus – Pascopyrum smithii* Herbaceous Vegetation type. 49
Figure 13. *Populus x acuminata / Symphoricarpos occidentalis* Woodland type.. 53
Figure 14. *Sarcobatus vermiculatus - Atriplex nuttallii / Distichlis stricta* Dwarf-shrubland type................ 53
Figure 15. *Rhus radicans* Shrubland type occurs on sandy soils. 56
Figure 16. *Rhus trilobata - Artemisia cana / Hesperostipa comata* Shrubland type. 56
Figure 17. *Symphoricarpos occidentalis / Elymus piperi* Shrubland type. 59
Figure 18. *Juniperus communis - Artemisia cana* Shrubland type. 59
Figure 19. *Juniperus horizontalis* – (*Festuca scabrella*) Dwarf-shrubland type. 64
Figure 20. *Festuca scabrella* Herbaceous Vegetation type... 64
Figure 21. *Krascheninnikovia lanata - Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation. 71
Figure 22. *Hesperostipa comata - Aristida longiseta - Carex filifolia* Herbaceous Vegetation type............. 71
Figure 23. *Achnatherum hymenoides - Hesperostipa comata* Herbaceous Vegetation type........................... 74
Figure 24. *Distichlis spicata* - (*Koeleria macrantha*) - (*Stipa viridula*) Herbaceous Vegetation type........... 74
Figure 25. *Muhlenbergia cuspidata / Hesperostipa comata* Herbaceous Vegetation type. 78
Figure 26. *Distichlis spicata - Gutierrezia sarothrae* Badlands Sparse Vegetation type............................... 78

List of Appendices

Appendix I. Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.
Appendix II. List of Plant Community Types identified by Cornish (1996) with relative importance in coulee and riparian habitats.
Appendix III. Correlation table of plant community types for the Mixedgrass and Dry Mixedgrass Natural Subregions with Similarity Ratings (After Corns 1983, Strong 2002).

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1.0 INTRODUCTION

Alberta Natural Heritage Information Centre (ANHIC) is responsible for the inventory, evaluation, and dissemination of information on elements of biodiversity in Alberta. Plant communities are recognised as elements of biodiversity which need to be identified and monitored. Internationally, standardised classification of ecological communities using vegetation has been recognised as an essential tool for identification, monitoring, and conservation of ecosystems (Grossman et al. 1998, NatureServe 2003, Jennings et al. 2003). Plant communities have specific plant species composition and physiognomy, which largely defines the habitat type selected for by animals and other life forms. Therefore, monitoring ecosystem health and changes in biodiversity can be achieved to a significant degree by monitoring changes in vegetation. Fortunately, vegetation is also relatively easy to measure, inventory and monitor both spatially and temporally, at various scales.

ANHIC collects information on the occurrence and distribution of plant community types and has prepared a preliminary provincial tracking list of plant community types of conservation concern (Allen 2003). This tracking list does not include common types that the ANHIC has minimal concerns regarding conservation status. Priority research is currently required to address gaps in plant community identification, description and distribution. The current project, in Writing-on-Stone Provincial Park (WOSPP), focuses on the identification of plant associations in the Dry Mixedgrass and Mixedgrass Natural Subregions of southern Alberta (Alberta Environmental Protection 1994). Limited data are available regarding unique and/or rare plant communities occupying coulee slopes and riparian zones in this region of Alberta. This information is important for monitoring and conserving elements of rare or special natural plant communities and plant species thus contributing to the biodiversity of the province. Notably many of these plant communities are recurring over the landscape but may occur as very small patches of 1m^2 or less.

The current research project focussed on identifying recurring plant communities for the coulees and riparian zones in Writing-on-Stone Provincial Park. Upland plant communities have been more thoroughly studied and these types were verified only. Alberta Sustainable Resource Development (ASRD) Resource Data Branch contracted Wildlands Ecological to complete this inventory of natural/semi-natural plant communities, statistically analyse the data and describe potential associations.

1.1 Objectives

The following key project objectives have been identified for the both study areas:

1) to develop a sampling protocol to collect detailed field data regarding natural/semi-natural plant communities of the coulee and riparian areas of the Writing-on-Stone Provincial Park, and reconnaissance-level survey of upland plant communities;
2) to correlate plant associations identified for the study area with those described for similar areas in Alberta and adjacent jurisdictions, and to apply a similarity rating based on ratings developed by Corns (1983);
3) to identify plant associations associated with the coulee and riparian ecosites identified by Cornish (1996);
4) to evaluate and assign a preliminary provincial ranking to each plant association; and
5) to produce a report summarising the projects objectives, methodology, results, and identified plant associations.

1.2 Study Area

Writing-on-Stone Provincial Park is located about 8 km from the USA-Canada and approximately 40 km east of the town of Milk River. It occupies 1780 ha covering all or portions of Sections 13,14, 23, 24, 25, 26, 34, 35, and 36 of Township 1 and Range 13 West of the 4th Meridian. Elevation ranges from 910 m at the Milk River to approximately 1050 m in the southeastern portion of the Park. The Park includes a section of the Milk River valley, four major coulees, hoodoos and badlands situated at the transition zone between the Dry Mixedgrass and Mixedgrass Natural Subregions (Alberta Environmental Protection 1994). The major coulees include, from east to west, Humphrey, Davis, Police and Van Cleeve (formerly Rocky) Coulees.

The climate of the Park is Continental Prairie with cold winters, warm summers, and low precipitation. The annual precipitation for the Short Grass Ecoregion (i.e. Dry Mixedgrass Natural Subregion) averages 27 cm and for the Mixed Grass Ecoregion (i.e. Mixedgrass Natural Subregion) averages 33 cm (Strong and Leggat 1992). Most precipitation is received between May and July, and extended periods of drought with potentially high evapotranspiration can result from hot dry periods with dry strong winds (Strong and Leggat 1992).

The topography of WOSPP is characterised by undulating to rolling upland grasslands with deeply eroded coulees and the broad flat valley of the Milk River. The Milk River is part of the Missouri River drainage and is the only river originating in Alberta, which drains into the Mississippi and eventually the Gulf of Mexico. Surface drainage in the Park directly affects landform and vegetation expression.

The Park is underlain by the Milk River Formation, which is characterised by sandstones with occasional shale beds (Alberta Recreation and Parks 1990, Watt 1971). Surficial materials consist of alluvial deposits in the river valley lowlands and predominately glacial till in upland areas (Alberta Recreation and Parks 1990). The Milk River valley is a typical glacial meltwater channel characterised by a wide flat valley and steep sidewalls. Much of the landscape is the result of wind and water erosion and freeze-thaw actions. Significant landforms occurring in Writing-on-Stone Provincial Park include steep coulees, sandstone cliffs, hoodoos, and badlands (Watt 1971).

Soils in the uplands are typically Orthic Chernozems with some solonetzic areas (Wershler 1980). Surficial materials here are commonly medium to sandy textured. Upper bench areas of the Milk River have primarily Orthic Brown Chernozems and the lower benches Orthic Regosols (Greenlee 1984). Soil textures on the upper benches are typically loamy while lower benches are mainly medium loam to sandy. On steep valley slopes there are areas of exposed bedrock without soil, and steep eroded slopes with Orthic Regosols grading towards less steep slopes (<60%) with Rego Chernozems (Wershler 1980). Brown Chernozems are the dominant soils of the Dry Mixedgrass Natural Subregion. Typical vegetation of this Subregion is needle grasses (*Stipa* spp.), blue grama grass (*Bouteloua gracilis*), dry sedges, prairie Selaginella (*Selaginella densa*), pasture sagewort (*Artemisia frigida*) and moss phlox (*Phlox hoodii*) (Alberta Environmental Protection 1994, Strong and Leggat 1992). In the Mixedgrass Subregion, Dark Brown Chernozems dominate the soils and the native grasslands typically include needle grasses, wheat grasses (*Agropyron spp., Elymus spp. Pascopyrum smithii*), forbs and dwarf shrubs (Alberta Environmental Protection 1994).

Riparian vegetation, such as cottonwood groves, and other lowland vegetation is dependent on episodic floods to establish optimal conditions for seedling establishment and maintenance. Fluctuations in seasonal runoff along ephemeral streams of the coulees also directly influence their valley bottom vegetation. The additional moisture found at seepage sites that occur at the base of gullies and toe slopes also directly affects the vegetation.

The vegetation of WOSPP has previously been studied and summarised by Watt (1971), Campbell (1981), and Lancaster (1988). More detailed vegetation inventories and research studies were completed by De Vries (1968), Wallis (1976), Wershler (1980), Underwood McLellan & Associates Limited (1973), and Alberta Recreation and Parks (1990). More recently, Cornish (1996) described upland vegetation plant communities and broadly defined coulee and riparian types for WOSPP.

Anthropogenic disturbances have had a major impact on vegetation in WOSPP. Prior to settlement by non-natives the area was an important spiritual and over-wintering site for natives (Alberta Recreation and Parks 1990). Historically, a North-West Mounted Police post was established at the mouth of Police Creek in 1887 (Alberta Recreation and Parks 1990, Watt 1971) and a rodeo grounds was situated on the north side of the Milk River in the northeast corner of the Park. After settlement of the area much of the upland grasslands was broken for crops and then subsequently either reverted to prairie or was seeded to non-native grassland (Lancaster 1990). Writing-on-Stone Provincial Park was established in 1957 and currently there is high visitation at the campground and use of the interpretative service along with some degree of hiking throughout the Park. The entire Park has been grazed in the past and currently most of the Park is under some form of grazing regime.

2.0 METHODS

2.1 Data Collection

A reconnaissance trip was completed to verify predefined and potential plant associations for the study area. During this visit sampling methodology and field logistics were confirmed. Field sampling efforts focused on data collection for natural/semi-natural plant associations occurring on coulee slopes and in riparian areas.

Previously described plant associations, especially riparian types described by Thompson and Hansen (2002) and upland types described by Cornish (1996), were sampled with one (1) detailed plot. Five (5) plots were completed in major plant association types that were poorly correlated to those identified on previous studies. Three (3) plots were placed in poorly correlated minor plant associations that occurred infrequently over the landscape. New plant associations with less than 3 sampling plots are included as tentative types pending further data collection.

Standard Site Description Forms (RDB 2002-1), Vegetation Description Forms (RDB 2002-3) and Vegetation Inventory Forms (MF5 Rev. 5/99) were used to record detailed plot data, site location, and GPS co-ordinates. Percent cover of vascular and non-vascular plants was estimated occularily within plots. All dominant and co-dominant differential species and other diagnostic species were recorded for each stratum. Photographs were obtained for all representative plant associations.

Sampling protocols adhered to the Ecological Land Survey Site Description Manual (Alberta Sustainable Resource Development 2003). Plot sizes for sites with tree strata were 11.3 m radius ($400m^2$), and for shrub and herbaceous strata a 5.6m radius plot ($100\ m^2$). The percent ground cover of all plant species was recorded. Plot dimensions were adjusted to stay within the plant community type where patch sizes were small. Daubenmire transects were used to sample plant communities dominated by graminoids and/or herbaceous cover. In these types a Daubenmire sampling frame (0.20m x 0.50m) was placed at 1m intervals along a 10 m transact (i.e. 10 sub-plots totalling $1.0\ m^2$). Transacts were centred within the $100\ m^2$ plots and at a 45° angle to slope's aspect depending on the size and distribution of the plant community being sampled. Plant communities occurring in small patches were sampled by reducing the length of the Daubenmire transact to stay within the boundaries of the type. The smallest community sampled was $1\ m^2$ and in this case subplots will be adjacent to each other and cover the entire patch. At all Daubenmire transacts incidental records of plant species were recorded over the larger 11.3 m radius plot to assist in description of the community. However, these data were not used for statistical analysis of the community types.

2.2 Data Analysis

Field data was entered into a database and then imported into PC-ORD Version 4 (McCune and Mefferd 1999) for analysis. Four different analyses were used to determine species groupings. The first was a subjective grouping based on field observations and a preliminary review of the data sheets. Secondly a Cluster Analysis was completed using Euclidean distance measurement with Ward's group linkage method. The results of this analysis were then graphed as a dendrogram. The third method involved De-trended Correspondence Analysis (DECORANA) which compares similarity and dissimilarity between sites. The results of that analysis were plotted graphically on two sets of axis to indicate potential associations based on species distribution and groupings. The fourth method was a two-way species indicator analysis (TWINSPAN) which simultaneously ranks samples and species along dominant gradients. The results were plotted in tabular form to indicate final community groupings based on the strengths of plant species associations.

2.3 Reporting

The framework for plant community descriptions is adapted from protocols established by the International Classification of Ecological Communities (Grossman et al. 1998, Jennings et al. 2003). Stratum definitions are based on Alberta Sustainable Resource Development (2003) and association classification is based on existing vegetation including all stages of succession (Braun-Blanquet 1965). Nomenclature for vascular plants follows Moss (1983) with updates according to Flora of North America (1993 - 2003). Non-vascular plant nomenclature follows Anderson et al. (1990) for brown mosses, Anderson (1990) for Sp*hagnum* spp., Stotler and Crandall-Stotler (1977) for liverworts, and Esslinger and Egan (1995) for lichens.

A correlation table was developed to compare plant associations with similar types described from other studies. Each plant association was given a similarity rating that accounts for scale (Corns 1983, Strong 2002). Identified plant associations are assigned a provincial ranking with supporting rational based on current provincial (ANHIC 2002, Allen 2003) and international standards (Grossman et al. 1998, Jennings et al. 2003).

2.3.1 Vegetation Classification System

Classification of terrestrial vegetated communities in WOSPP adhered to the standards developed by Grossman et al. (1998) and Jennings et al. (2003). This hierarchical system lists terrestrial ecological communities first by physiognomic characteristics, and then by floristics. The physiognomic groupings include Class(1), Subclass (2), Group (3), Subgroup (4), and Formation (5).

1) Class Level: At this level the vegetation structure of the dominant uppermost strata determines the Class as one of the following:
    1. Forest/Woodland - Trees with crowns overlapping (25-100% cover)
    2. Shrubland - Shrubs generally >0.5m tall forming >25% cover
    3. Dwarf-shrubland - Shrubs <0.5m tall forming >25% cover
    4. Herbaceous - Graminoids, ferns and forbs dominate
    5. Nonvascular - bryophytes, lichens and algae dominate
    6. Sparse - Abiotic substrate dominate

2) Subclass Level: This level is based on the growth-form characteristics of the dominant life form. Generally, this is determined by leaf structure and phenology (e.g. evergreen, deciduous, mixed evergreen/deciduous), persistence (i.e. perennial, annual), and substrate characteristics (e.g. rocks, sand, exposed lakeshore).

3) Group Level: At this classification level community types are determined by leaf characteristics (broad leaf, needle, scale, etc.). Herbaceous and nonvascular classes are separated based on the presence of woody plant strata. Sparse vegetation communities are separated on the basis of topographic position (eg. shores, cliffs).

4) Subgroup Level: At this level a further division of each group is based on their Natural/Seminatural or Cultural origins.

5) Formation Level: The Formation Level is determined by evaluating vegetation physiognomy or structure based on broad environmental factors such as: landscape position and hydrological regime (e.g. Temperate or Subpolar Temperate or Subpolar Deciduous shrubland). An adaptation of the Cowardin System (Grossman et. al 1998) was used to describe hydrological regimes of wetland plant communities.

Floristic Level: There are two final levels in the classification hierarchy both based on floristics. These include the Alliance and the Association both defined by dominant species in the plant community. Jennings et al. (2003) document detailed guidelines for describing these levels providing a further refinement of the guidelines initially established by Grossman *et al.* (1998).

1) Alliance Level: The alliance is a physiognomically uniform group of plant associations characteristically with one or more diagnostic plant species, generally, occurring in the uppermost stratum

2) Association Level: This is the lowest level of the hierarchy and is defined as a plant community type with definite floristic composition, uniform habitat conditions, and uniform physiognomy. Diagnostic species with a minimum of 60% constancy are used to describe the type (Jennings et al. 2003). Species occurring in the uppermost strata are listed first (separated by a hyphen (-) if in the same strata, and a slash (/) if in separate strata) and then diagnostic species in each successive lower level of strata. Species names are listed in decreasing order of dominance or constancy for each stratum.

2.3.2 Floristic Unit Classification Confidence Level

Plant associations described in this report are rated according to our confidence level in the field data and description *as per* Grossman et al. (1998) and Jennings et al. (2003). For previously described types the rating indicates how well the WOSPP stands match the existing published description for the type. In the case of tentative types it is based on how common the type appeared to be in the study area, how consistent the floristic composition was between stands, and/or how the stand relates to descriptions of similar types. Confidence Level 1 (Strong) indicates a high degree of quantitative analysis from detailed plots and that the type is within the known range of distribution for the published type. Level 2 (Moderate) includes types that are poorly correlated to published types, lack quantitative data, and/or distribution of the type is uncertain. Level 3 (Weak) types are based on limited, unpublished, or weak plot data, or qualitative descriptions only. This type may have potential to be listed as distinct plant association type based on observations by qualified researchers. Such types may be recurring over the landscape, have very distinct vegetative physiognomy, and/or dominance and constancy of plant species.

2.3.2 Provincial Conservation Rankings

Preliminary provincial conservation rankings as described in Table 1 are assigned to each plant association based on the field survey results and a review of the literature on similar types. This ranking system is based on the system originally developed by The Nature Conservancy (Allen 2003). The preliminary ranks range from a designation of S1 for rare or threatened communities to S5 to describe common and widespread communities. The two major criteria used in ranking communities are the total number of occurrences and the estimated total area occupied by each plant association type. Other considerations include trends in range expansion and immediate threats to community persistence. Very limited quantitative information is available regarding Dry Mixedgrass and Mixedgrass Subregion plant associations and until such information becomes available these conservation rankings remain preliminary in nature. For previously described types that are listed on the provincial tracking list (Allen 2003), the plant community code and ANHIC ranking are included. In some cases, preliminary rankings are based on individual species rankings, however, it should be noted that while individual species may be provincially common their occurrence as an assemblage (i.e. community) may not be common.

Table 1. **Provincial plant community conservation ranking guidelines (Allen 2003).**

RANK	CRITERIA
S1	Five or fewer occurrences or very few remaining hectares or some factor(s) exist that make the community especially vulnerable to extirpation.
S2	Six to 20 occurrences or very few remaining hectares or some factor(s) exist that make it very vulnerable to extirpation throughout its range.
S3	21 to 100 occurrences. May be rare and local throughout its range or found locally, even abundantly, in a restricted range, or vulnerable to extirpation throughout it range because of some specific factor(s).
S4	Uncommon, but not rare, although it may be quite rare in parts of its range, especially at the periphery. Apparently not vulnerable in most of its range.
S5	Common, widespread and abundant provincially; although it may be quite rare in parts of its range, especially at the periphery. Not vulnerable in most of its range.
SU	Not able to rank and status is uncertain.
SH	Historically present. Presumed eliminated in the province with little or no likelihood it will be rediscovered. There may be potential for restoration.
SX	Believed to be eliminated throughout the province with virtually no likelihood that it will be rediscovered, with no restoration potential due to extinction of dominant or characteristic species.
GP (SP)	Potentially exists; further documentation required.
S?	Element is not yet ranked.

3.0 RESULTS and DISCUSSION

3.1 Field Program

A reconnaissance survey was completed between 11-13 July 2003 followed by the detailed field-sampling program, which was completed on 12 August 2003. The entire Park, including all drainages, was surveyed for potential plant associations. A total of 88 detailed plots (Appendix I) were completed identifying 52 plant association types in total consisting on 32 previously described plant associations (Existing Classifications) and 20 proposed or tentative types. Within the previously described types there were 4 Woodland, 10 Shrubland and 18 Herbaceous Vegetation types. Proposed or tentative plant associations included descriptions of 1 Woodland, 7 Shrubland, 11 Herbaceous Vegetation, and 1 Sparse Vegetation type. Appendix II provides a correlation of plant associations described on the current study with those identified by Cornish (1996) and indicates their relative importance in the coulees and riparian zone. Appendix III provides a correlation, with similarity ranking, between plant associations sampled during the current study and those described on other studies.

Plot data indicated that invasive disturbance-increaser plants are widely distributed throughout WOSPP with especially high diversity and cover values in the riparian zones and heavily grazed areas. This presented difficulty, in some portions of the study area, determining and locating communities in a natural/semi-natural state. In fact the majority of plots included some non-native or invasive disturbance-increasers. As expected there was a wealth of potential plant associations within the riparian zone and coulees. In some cases plant communities formed well-defined patches that were easily recognisable and were either found to recur over the study area or based on habitat preferences had potential to recur. Many of the tentative types were described by only one plot and additional sampling is recommended to better describe these.

For consistency and ease of presentation all previously described types and tentative plant association types are presented using the same framework adapted from Grossman et al. (1998) and Jennings et al. (2003). Generally, only one plot was completed to confirm previously identified types. The summary descriptions for these are largely based on data from the published sources although a comparison to the WOSPP plot is also provided. The dominant plant species includes those plants, which have the highest average percent ground cover. Co-dominants include other plant species that have high constancy and also have significant cover within the plots sampled. Diagnostic species are those that occur in approximately 60% or more of the plots sampled (Jennings et al. 2003). In general, plants species are recorded in diminishing order of dominance or importance within each stratum (i.e. trees, shrubs, forbs). Note that all Proposed Provincial Conservation Rankings are preliminary in nature.

3.2 EXISTING CLASSIFICATIONS

3.2.1 WOODLAND

3.2.1.1 ***Populus deltoides / Glycyrrhiza lepidota* Woodland**
Plains Cottonwood / Wild licorice Woodland

DESCRIPTION:
This is an open riparian type occurring on older alluvial sites including floodplain terraces. It is equivalent to the *Populus deltoides* Herbaceous Community Type described by Thompson and Hansen (2002). In WOSPP, this type occurs as isolated stands in the Milk River riparian zone and major coulees. *Symphoricarpos occidentalis* is the most frequent shrub although total shrub cover is usually less than 25%. The herb layer is lush with a diversity of plant species, including many non-native post-disturbance species. Dominant herbaceous plants include *Bromus inermis, Elymus canadensis, Agropyron repens, Pascopyrum smithii, Muhlenbergia racemosa, Glycyrrhiza lepidota* (83% constancy*), Solidago canadensis,* and *Equisetum arvense.* Soils are generally Regosols with fine textured mineral materials overlying more coarse sand and gravel (Thompson and Hansen 2002). Frequent disturbance from flooding and grazing maintain this community in a disclimax state. In the study area, this type occurs along the Milk River and major coulees as small isolated stands consisting of several mature trees.

On the present study the one stand sampled occurred in a dry side-channel with recent alluvial deposits. At this site there were several over-mature *Populus deltoides* trees and a shrub layer of regenerating *Populus deltoides* (40% cover). The herb layer was dominated by variety of weedy species and included *Agrostis scabra (15%), Equisetum arvense* (15%), *Bromus inermis* (2.5%), *Cirsium arvense* (2.5%), and trace amounts of *Hordeum jubatum, Puccinellia nuttalliana, Phalaris arundinacea, Nepeta cataria, Melilotus albus, Melilotus officinalis, Arctium minus, Sonchus arvensis, Plantago major*, and *Oenothera biennis.*

NatureServe (2003) describes a *Populus deltoides - (Salix amygdaloides) / Salix (exigua, interior)* Woodland (CEGL000659) which appears to be similar to this type but it has a more well developed shrub layer. Allen (2003) does not list this community type although similar ones are included on the provincial tracking list.

CLASS: Woodland
SUBCLASS: Deciduous Woodland
GROUP: Cold-deciduous Woodland
SUBGROUP: Natural/Semi-natural
FORMATION: Temporarily Flooded Cold-deciduous Woodland
ALLIANCE: *Populus deltoides* Woodland Alliance
ASSOCIATION: ***Populus deltoides / Glycyrrhiza lepidota* Woodland**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Relatively good correlation of plot data with the published literature for the type (Thompson and Hansen 2002), and occurs within the known geographical range.

DOMINANT SPECIES: *Elymus trachycaulus, Bromus inermis, Poa pratensis, Elymus canadensis, Pascopyrum smithii*
CO-DOMINANT SPECIES: *Agropyron repens, Muhlenbergia racemosa, Equisetum arvense, Poa palustris, Melilotus alba, Solidago canadensis, Glycyrrhiza lepidota*
DIAGNOSTIC SPECIES: *Populus deltoides, Symphoricarpos occidentalis, Glycyrrhiza lepidota, Agropyron repens*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: Habitat specific and minor type restricted to southern portion of east-central

Alberta in the Dry Mixedgrass Natural Subregion (Thompson and Hansen 2002).
PLOT NUMBERS: 61

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 6, 2004).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.1.2 Populus angustifolia / Symphoricarpos occidentalis **Woodland**
Narrow-leaf Cottonwood / Buck brush Woodland

DESCRIPTION:
Thompson and Hansen (2002) describe this community type as a minor to incidental type occupying riparian zones in the Mixedgrass Natural Subregion. Cornish (1996) described a Cottonwood (Narrow-leaf)/ Choke cherry / Bluegrass community similar to this type that was "very limited in extent" in the Park. These stands form through the establishment of seedlings on recently deposited alluvium in areas receiving full sunlight. Typical sites include river alluvial deposit bars and islands. Cottonwoods are pioneering seral species on these sites and these stands do not form climax communities. Episodic flooding with significant deposits of fresh alluvial materials is required to establish new stands. *Populus angustifolia* dominate the tree layer although *Populus deltoides* is also often present in these stands. *Symphoricarpos occidentalis, Amelanchier alnifolia, Prunus virginiana,* and *Rosa spp.* dominate the shrub layer. The dense herb layer is diverse and is largely represented by disturbance-increasers. Dominant herbaceous plants identified by Thompson and Hansen (2002) include *Bromus inermis, Poa pratensis, Glycyrrhiza lepidota, Solidago gigantea, Cirsium arvense, Arctium minus,* and *Poa palustris*

At the one plot completed in this type *Populus angustifolia* was present at 20% cover. The shrub layer included *Symphoricarpos occidentalis* (20%), *Prunus virginiana* (5%), *Cornus stolonifera* (5%), *Rosa woodsii* (3%) and *Salix* spp. (1%). The herb layer was diverse and consisted of *Solidago gigantea* (37.5%), *Poa pratensis* (37.5%), *Bromus inermis* (15%), *Thalictrum venulosum* (15%) and *Galium boreale* (2.5%). Other herbaceous species occurring at trace amounts included *Melilotus albus, Melilotus officinalis, Cerastium arvense, Equisetum arvense, Heracleum lanatum, Arctium minus, Astragalus spp., Sonchus sp., Vicia americana,* and *Smilacina stellata.*

NatureServe (2003) describes a *Populus angustifolia / Symphoricarpos occidentalis* Woodland (CEGL002648) that occurs in the Colorado. Few details are provided regarding floristic composition and although the dominant and several of the co-dominant species appear to be the same this appears to be a different association type.

CLASS: Woodland
SUBCLASS: Deciduous Woodland
GROUP: Temperate or Subpolar Cold-deciduous Woodland
SUBGROUP: Natural/Semi-natural
FORMATION: Intermittently Flooded Temperate or Subpolar Cold-deciduous Woodland

ALLIANCE: *Populus angustifolia* Woodland Alliance
ASSOCIATION: ***Populus angustifolia / Symphoricarpos occidentalis* Woodland**
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Relatively good correlation of plot data with the published literature for the type (Thompson and Hansen 2002), and occurs within known geographical range.

DOMINANT SPECIES: *Populus angustifolia, Symphoricarpos occidentalis, Bromus inermis, Poa pratensis*
CO-DOMINANT SPECIES: *Populus deltoides, Symphoricarpos occidentalis, Amelanchier alnifolia, Prunus virginiana, Rosa spp., Glycyrrhiza lepidota, Solidago gigantea, Cirsium arvense, Arctium minus, Poa palustris.*
DIAGNOSTIC SPECIES: *Populus angustifolia, Symphoricarpos occidentalis, Bromus inermis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: Total areal extent of this type is low in WOSPP and stands appear to be declining in health. Recent flooding has produced some recruitment of *Populus angustifolia* but this type is vulnerable to loss due to changes in flooding regimes and possibly overgrazing.
PLOT NUMBERS: 1

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 6, 2004).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.1.3 ***Populus angustifolia / Cornus sericea* Woodland**
Narrow-leaf Cottonwood / Red-Osier Dogwood Woodland

DESCRIPTION:
Thompson and Hansen (2002) describe this as a minor to incidental type in the riparian zone of the Mixedgrass Natural Subregion. Stands are initiated on recent alluvial deposits, on bars and islands, along major streams where succession proceeds from *Populus angustifolia* / Recent Alluvial Bar to the *Populus angustifolia / Cornus sericea* Community Type. *Populus angustifolia* dominates the tree layer (30-60%) although *Populus x acuminata* and *Populus balsamifera* may be present (0-10%). The shrub and herbaceous layers are diverse and dense. Dominant shrubs include *Cornus sericea, Salix exigua, Rosa woodsii*, and *Rosa acicularis.* The herb layer is diverse including *Agrostis stolonifera, Phalaris arundinacea, Equisetum laevigatum, Heracleum lanatum, Solidago spp.* These stands typically have high cover of disturbance increasers such as *Poa pratensis, Cirsium arvense, Sonchus arvensis, Taraxacum officinale*, and other species.

At the one plot completed, in WOSPP, *Populus angustifolia* was present at 30% cover. The shrub layer was diverse and consisted of *Cornus stolonifera* (10%), *Amelanchier alnifolia* (10%), *Prunus virginiana* (5%), and lesser amounts of *Symphoricarpos occidentalis, Ribes aureum, Shepherdia argentea, Clematis ligusticifolia,* and *Rhus trilobata.* Plant species in the herb layer occurred individually at less than 1%

cover and included *Bromus inermis, Melilotus officinalis, Elymus trachycaulus, Artemisia frigida, Thermopsis rhombifolia, Solidago missouriensis, Solidago gigantea, Tragopogon dubius, Aster laevis, Hedysarum boreale, Hesperostipa comata, Koeleria macrantha, Calamovilfa longifolia,* and *Smilacina stellata.*

CLASS: Woodland
SUBCLASS: Deciduous Woodland
GROUP: Temperate or Subpolar Cold-deciduous Woodland
SUBGROUP: Natural/Semi-natural
FORMATION: Temporarily Flooded Temperate or Subpolar Cold-deciduous Woodland
ALLIANCE: *Populus angustifolia* Woodland Alliance
ASSOCIATION: ***Populus angustifolia / Cornus sericea* Woodland**
UNIQUE IDENTIFIER: NatureServe CEGL002664, Alberta CEGL002664
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Relatively good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Populus angustifolia, Salix exigua, Rosa woodsii, Cornus sericea, Rosa acicularis, Agrostis stolonifera, Equisetum laevigatum*
CO-DOMINANT SPECIES: *Symphoricarpos occidentalis, Amelanchier alnifolia, Potentilla fruticosa, Phalaris arundinacea, Heracleum lanatum, Solidago spp., Sonchus spp., Poa pratensis, Cirsium arvense, Glycyrrhiza lepidota, Solidago canadensis*
DIAGNOSTIC SPECIES: *Populus angustifolia, Cornus sericea, Symphoricarpos occidentalis, Rosa spp., Poa pratensis, Cirsium arvense, Glycyrrhiza lepidota, Smilacina stellata, Solidago canadensis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: NatureServe (2003) ranks this type globally as G4. Provincially it is currently ranked as S2S3 (Allen 2003). Mature stands in WOSPP appear to be declining and although some recruitment was noted actual areal extent of this type is low.
PLOT NUMBERS: 77

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 6, 2004).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.1.4 ***Populus balsamifera / Symphoricarpos occidentalis* Woodland**
Balsam Poplar / Buck brush Woodland

DESCRIPTION:
Thompson and Hansen (2002) consider this plant community to be a minor to incidental type at lower elevations throughout southern Alberta with the exception of the Dry Mixedgrass Subregion. It establishes on recent alluvial deposits along major streams and rivers. Soils are generally thick Regosols, which may develop into Brunisols or Chernozems on older stable sites. The water table is often 1 m below ground surface in summer and soils are well drained loams to coarse sands. This community type is a moderately disturbed secondary successional stage of the mid-seral *Populus balsamifera - Cornus sericea* community

(Thompson and Hansen 2002). It has a high degree of species diversity in the shrub and herbaceous layers and the tree layer may have significant cover of *Populus angustifolia*. Thompson and Hansen (2002) identify the dominant species in the shrub layer to include *Symphoricarpos occidentalis, Rosa spp, Elaeagnus commutata*, and *Amelanchier alnifolia*. Dominant graminoids include *Poa pratensis, Phleum pratense, Bromus inermis*, and *Agrostis stolonifera*. Important forbs are *Thalictrum occidentalis, Trifolium repens, Taraxacum officinale, Smilacina stellata, Lathyrus ochroleucus, Cirsium arvense* and others (Thompson and Hansen 2002).

At the single plot completed in WOSPP *Populus balsamifera* was the only species of tree. The shrub layer was diverse and species with 5% cover or more included *Symphoricarpos occidentalis, Betula occidentalis, Prunus virginiana*, and *Amelanchier alnifolia*. Shrub species with less than 5% cover included *Juniperus communis, Ribes aureum, Cornus stolonifera, Rhus trilobata, Rosa acicularis* and *Clematis ligusticifolia*. The herb layer consisted of *Solidago gigantea* (15%), *Poa pratensis* (2.5%), and trace amounts of *Stipa viridula, Elymus canadensis, Thalictrum venulosum, Achillea millefolium, Deschampsia cespitosa*, and *Smilacina stellata*.

CLASS: Woodland
SUBCLASS: Deciduous Woodland
GROUP: Temperate or Subpolar Cold-deciduous Woodland
SUBGROUP: Natural/Semi-natural
FORMATION: Intermittently Flooded Temperate or Subpolar Cold-deciduous Woodland
ALLIANCE: *Populus balsamifera* Woodland Alliance
ASSOCIATION: ***Populus balsamifera / Symphoricarpos occidentalis* Woodland**
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Relatively good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Populus balsamifera, Symphoricarpos occidentalis, Poa pratensis*
CO-DOMINANT SPECIES: *Rosa spp, Elaeagnus commutata, Amelanchier alnifolia, Poa pratensis, Phleum pratense, Bromus inermis, Agrostis stolonifera, Thalictrum occidentalis, Trifolium repens, Taraxacum officinale, Smilacina stellata, Lathyrus ochroleucus, Cirsium arvense*
DIAGNOSTIC SPECIES: *Populus balsamifera, Rosa spp, Symphoricarpos occidentalis, Amelanchier alnifolia, Poa pratensis, Smilacina stellata*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3S4
RANK JUSTIFICATION: Minor to incidental type in most areas of southern Alberta but rare in Dry Mixedgrass Natural Subregion (Thompson and Hansen 2002).
PLOT NUMBERS: 68

REFERENCES:

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2 SHRUBLAND

3.2.2.1 ***Betula occidentalis*** **Shrubland**
Water Birch Shrubland

DESCRIPTION:
Thompson and Hansen (2002) report that stands occur on alluvial terraces, near springs and seepage areas, and along stream banks and abandoned channels. NatureServe (2003) lists a *Betula occidentalis / Cornus sericea* Shrubland Type (CEGL001161) that occurs in Montana and appears to be very similar to this community type. Soils are generally thin Regosols overlying coarse textured colluvium and cobbles. In WOSPP, this type was relatively common and occurs along stream banks and old abandoned channels, at seepage sites in toe slope positions and at the base of gullies. *Betula occidentalis* forms a closed canopy (40-70%) with sparse shrub and herbaceous layers. Dominant plants include *Amelanchier alnifolia, Cornus sericea, Juniperus horizontalis, Symphoricarpos occidentalis, Bromus inermis, Smilacina stellata, Aster laevis,* and *Galium boreale* (Thomson and Hansen 2002). In the WOSPP, dominant shrubs included *Prunus virginiana, Juniperus communis* with lesser amounts of *Symphoricarpos occidentalis, Ribes oxyacanthoides*, and *Toxicodendron radicans*. The herbaceous layer commonly supports introduced disturbance-related species. Cornish (1996) described a more generalised type as Chokecherry - Water Birch - Buckbrush / bluegrass - giant wild rye Community Type.

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Temporarily Flooded Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Betula occidentalis* Shrubland Alliance
ASSOCIATION: ***Betula occidentalis*** **Shrubland**
UNIQUE IDENTIFIER: Alberta CEAB000169
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Generally poor correlation of herbaceous plot data with the published literature for the type however it occurs within the known geographical range.

DOMINANT SPECIES: *Betula occidentalis, Bromus inermis, Smilacina stellata*
CO-DOMINANT SPECIES: *Prunus virginiana, Juniperus horizontalis, Prunus virginiana, Symphoricarpos occidentalis, Aster laevis, Galium boreale, Poa pratensis*
DIAGNOSTIC SPECIES: *Betula occidentalis, Rosa spp., Cornus sericea, Amelanchier alnifolia, Clematis ligusticifolia, Smilacina stellata*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: Relatively common type in WOSPP. Allen (2003) ranked this type as SU in Alberta. NatureServe (2003) ranks the *Betula occidentalis / Cornus sericea* Shrubland Type as G3.
PLOT NUMBERS: 62

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Feb. 6, 2004).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2.2 *Shepherdia argentea* Shrubland
Thorny Buffaloberry Shrubland

DESCRIPTION:

NatureServe (2003) describe this community as a mesic shrubland type found in the northern Great Plains with representation in Montana, and possibly in Manitoba and Saskatchewan. Thompson and Hansen (2002) identified this as a minor type in southern Alberta that is found on alluvial floodplain terraces along streams and rivers. It also occurs in steep valley ravines and swales with higher surface waters, and occasionally on hillsides below seeps and springs. This plant association forms dense impenetrable thickets often with limited cover in the herbaceous layer. In WOSPP, this type was frequently encountered in the Milk River floodplain, gullies, and in association with seepage sites on valley slopes. According to Thompson and Hansen (2002) common species associated with this type include *Symphoricarpos occidentalis, Rosa spp., Ribes aureum, Poa pratensis, Bromus inermis, Elymus trachycaulus, Achillea millefolium, Cirsium arvense*, and *Galium spp.* At the one plot completed, in WOSPP, the understory was sparse with less than 2% cover consisting of *Bromus inermis, Taraxacum officinale*, and *Equisetum arvense*. Other shrubs recorded at this site included *Rosa acicularis, Ribes aureum, Symphoricarpos occidentalis* and *Clematis ligusticifolia.*

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Temporarily Flooded Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Shepherdia argentea* Shrubland Alliance
ASSOCIATION: ***Shepherdia argentea* Shrubland**
UNIQUE IDENTIFIER: NatureServe CEGL001128
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Shepherdia argentea*
CO-DOMINANT SPECIES: *Symphoricarpos occidentalis, Rosa spp., Ribes aureum, Poa pratensis, Bromus inermis, Elymus trachycaulus, Achillea millefolium, Cirsium arvense, Galium spp.*
DIAGNOSTIC SPECIES: *Shepherdia argentea, Symphoricarpos occidentalis, Rosa spp., Poa pratensis, Achillea millefolium*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3
RANK JUSTIFICATION: Minor type in southern Alberta (Thompson and Hansen 2002). Community Type is relatively common in riparian zones and gullies in WOSPP but availability of suitable habitat may be limited. This type is ranked S? in Saskatchewan, S3? in Montana, and G3G4 globally (NatureServe 2003).
PLOT NUMBERS: 60

REFERENCES:

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 6, 2004).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2.3 ***Elaeagnus commutata*** **Shrubland**

Silverberry Shrubland

DESCRIPTION:
This type appears to be very similar to the *Elaeagnus commutata* Shrubland type described by NatureServe (2003) and included on the provincial tracking list (Allen 2003). It often forms stringers along streams in the ecotone between the riparian zone and grassland/steppe zone. In WOSPP, this shrubland type was encountered infrequently. The shrublayer is dominated by *Elaeagnus commutata*, with lesser amounts of *Salix* spp., *Amelanchier alnifolia*, *Prunus virginiana*, *Rosa* spp., and *Artemisia cana*. Herbaceous plant species associated with this type include *Poa pratensis, Phleum pratense, Elymus trachycaulus, Hesperostipa comata, Koeleria macrantha, Pulsatilla patens ssp. multifida* and *Geum triflorum*. The one plot completed in WOSPP generally correlated well to the description provided by NatureServe (2003). However, at the WOSPP site the presence of *Grindelia squarrosa, Thermopsis rhombifolia,* and other drought-tolerant plants indicated drier than normal conditions. A similar upland type listed by Allen (2003) is *Elaeagnus commutata - Pascopyrum smithii*, which forms open thickets in mixed grasslands

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Temporarily FloodedTemperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Elaeagnus commutata* Shrubland Alliance
ASSOCIATION: ***Elaeagnus commutata* Shrubland**
UNIQUE IDENTIFIER: NatureServe CEGL001098, Alberta CEAB000060
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Relatively good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Elaeagnus commutata*

CO-DOMINANT SPECIES: *Symphoricarpos occidentalis, Rosa spp., Bromus inermis, Poa pratensis, Juncus balticus, Cirsium arvense, Elymus trachycaulus, Achillea millefolium, Solidago canadensis*
DIAGNOSTIC SPECIES: *Elaeagnus commutata, Rosa spp., Symphoricarpos occidentalis, Bromus inermis, Poa pratensis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2?
RANK JUSTIFICATION: Allen (2003) ranked this type as SU in Alberta while NatureServe (2003) ranked this type as G2Q. It was not a frequently encountered type in WOSPP.
PLOT NUMBERS: 86

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 6, 2004).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2.4 ***Prunus virginiana* Shrubland**
Choke Cherry Shrubland

DESCRIPTION:

Thompson and Hansen (2002) describe this community as a minor type along streams, rivers, and open waters in southern Alberta. NatureServe (2003) reports this type as widespread in the northwestern Great Plains. This shrubland type was common throughout WOSPP occurring in riparian zones, on north aspects, in ravines and gullies, and at seepage sites. It occupies the drier portions of riparian zones and wetland areas. In WOSPP it was also found to occupy seepage sites, toe slope positions, slopes on north aspects, and the lower portions of gullies where it forms dense thickets with high canopy closure. Thompson and Hansen (2002) reported associated shrubs to include *Symphoricarpos occidentalis*, *Rosa* spp., *Amelanchier alnifolia* and *Ribes oxyacanthoides*. WOSPP stands were found to have a very sparse herb layer that was limited to *Bromus inermis, Poa pratensis, Smilacina stellata,* and *Urtica dioica.* Cornish (1996) described a coarser scale stand of Choke Cherry - Water Birch - Buckbrush / Bluegrass - Giant Wild Rye.

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Mesic Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Prunus virginiana* Shrubland Alliance
ASSOCIATION: ***Prunus virginiana* Shrubland**
UNIQUE IDENTIFIER: NatureServe CEGL001108
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Sites variable but moderately good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Prunus virginiana*
CO-DOMINANT SPECIES: *Symphoricarpos occidentalis*, *Rosa* spp., *Amelanchier alnifolia, Ribes oxyacanthoides, Bromus inermis, Poa pratensis, Smilacina stellata, Urtica dioica*
DIAGNOSTIC SPECIES: *Prunus virginiana, Symphoricarpos occidentalis, Rosa* spp.

PROPOSED PROVINCIAL CONSERVATION RANKING: S4
RANK JUSTIFICATION: Common type in WOSPP and appears to be common in southern Alberta. NatureServe (2003) assigned a global ranking of G4Q.
PLOT NUMBERS: 3,49,63

REFERENCES:

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 6, 2004).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2.5 ***Amelanchier alnifolia*** **Shrubland**

Saskatoon Shrubland

DESCRIPTION:

This plant association is distributed through the northern Great Plains of the United States and Canada (NatureServe 2003). In WOSPP, this type was not frequently encountered but does exist in draws, moist coulee slopes and riparian zones where additional moisture is available (Wershler 1980). On the current study one stand was sampled from a draw in the hoodoos. Soils are moderately well drained, with submesic moisture levels and a mesotrophic (medium) nutrient regime. *Amelanchier alnifolia* forms a closed canopy (80%) with minor amounts of *Prunus virginiana*, *Ribes aureum* and *Clematis ligusticifolia*. Herbaceous vegetation cover is low and includes *Elymus trachycaulus, Smilacina stellata* and *Heterotheca villosa*.

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Submesic Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Amelanchier alnifolia* Shrubland Alliance
ASSOCIATION: ***Amelanchier alnifolia*** **Shrubland**
UNIQUE IDENTIFIER: NatureServe CEGL002183
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Occurs within the known geographical range but only one plot completed in WOSPP and grassland types are not well documented.

DOMINANT SPECIES: *Amelanchier alnifolia*
CO-DOMINANT SPECIES: *Prunus virginiana*, *Ribes aureum, Clematis ligusticifolia*, E*lymus trachycaulus, Smilacina stellata, Heterotheca villosa.*
DIAGNOSTIC SPECIES: *Amelanchier alnifolia*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: In WOSPP, *Amelanchier alnifolia* is a common species associated with the moist coulee slopes, draws and other moisture receiving sites (Wershler 1980). It is listed as G? by NatureServe (2003).
PLOT NUMBERS: 79

REFERENCES:

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Wershler, C.R. 1980. South Writing-on-Stone Natural History Inventory.

3.2.2.6 Arctostaphylos uva-ursi **Dwarf-shrubland**
Kinnikinnick Dwarf-shrubland

DESCRIPTION:
At the one plot completed in WOSPP, soils were we drained with xeric moisture levels and submesotrophic (poor) nutrient regimes. This type is relatively common in WOSPP occurring on south facing slopes and in other well-drained areas. At the one plot completed in WOSPP the dominant ground cover was *Arctostaphylos uva-ursi* (63%) which forms dense mats. Associated species included *Juniperus communis, Hedysarum boreale,* and *Hymenoxys acaulis,* each with 15% cover. Other species at less than 3% cover included *Juniperus horizontalis, Pascopyrum smithii, Koeleria macrantha, Eriogonum flavum, Achillea millefolium,* and *Comandra umbellatum.* NatureServe (2003) reports a similar subalpine to lower alpine community type (CEGL001392) from Washington State but no similar types for the grasslands. Wheatley and Bentz (2002) described a similar type for the Central Parkland Natural Subregion that occurs on sandy upland plains. The WOSPP type does not appear to be identical to either of these types although there are certain similarities in floristics to the Central Parkland type described by Wheatley and Bentz (2002).

CLASS: Dwarf-shrubland
SUBCLASS: Evergreen Dwarf-shrubland
GROUP: Temperate or Subpolar Needle-leaved or microphyllous evergreen dwarf-shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Xeric Temperate or Subpolar Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland
ALLIANCE: *Arctostaphylos uva-ursi* Dwarf-shrubland Alliance
ASSOCIATION: ***Arctostaphylos uva-ursi* Dwarf-shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Only one plot completed in WOSPP and no other references located for the grasslands. Geographical range of this type is not known.

DOMINANT SPECIES: *Arctostaphylos uva-ursi, Juniperus horizontalis, Hedysarum boreale, Hymenoxys acaulis*
CO-DOMINANT SPECIES: *Juniperus communis, Pascopyrum smithii, Koeleria macrantha, Eriogonum flavum, Achillea millefolium, Comandra umbellatum*
DIAGNOSTIC SPECIES: *Arctostaphylos uva-ursi, Juniperus horizontalis, Koeleria macrantha*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4?
RANK JUSTIFICATION: The species *Arctostaphylos uva-ursi* is secure provincially (S5) and globally (G5) (ANHIC 2002). In the Parkland Natural Subregion Wheatley and Bentz (2002) gave this community type a preliminary rank of S5.
PLOT NUMBERS: 73

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Wheatley, M. and J. Bentz. 2002. A preliminary classification of plant communities in the Central Parkland Natural Subregion of Alberta. Prep. for Alberta Sustainable Resource Development, Resource Data Branch, Edmonton. Prep. by Geowest Environmental Consultants Ltd., Edmonton

3.2.2.7 *Salix exigua* Shrubland
Sandbar Willow Shrubland

DESCRIPTION:
This early seral community type is wide spread at low to mid elevations throughout much of Alberta occurring on moist alluvial deposits subject to frequent flooding (Thompson and Hansen 2002). In WOSPP, it is relatively common along the Milk River. Soils range from fine heavy clays to coarse textured sandy gravels that are mostly Regosols or less often Chernozems. This type supports a wide diversity of plant species in the tree, shrub and herbaceous layers. Scattered trees may include *Acer negundo, Populus balsamifera* and *Populus deltoides*. The shrub layer is dominated by *Salix exigua* cover that averages over 85% (40-98% range). Other shrubs include *Rosa spp., Salix lutea*, and *Cornus sericea*. Common herbaceous layer plants include *Phalaris arundinacea, Spartina pectinata, Spartina gracilis, Carex utriculata, Agrostis stolonifera, Equisetum arvense*, and *Polygonum amphibium*.

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Intermittently Flooded Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Salix exigua* Shrubland Alliance
ASSOCIATION: ***Salix exigua* Shrubland**
UNIQUE IDENTIFIER: NatureServe CEGL001197
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Salix exigua, Phalaris arundinacea, Spartina pectinata, Spartina gracilis, Carex utriculata, Agrostis stolonifera, Equisetum arvense*
CO-DOMINANT SPECIES: *Acer negundo, Populus balsamifera, Populus deltoides, Rosa* spp., *Polygonum amphibium, Poa palustris, Carex aquatilis, Salix lutea, Cornus sericea*
DIAGNOSTIC SPECIES: *Salix exigua*

PROPOSED PROVINCIAL CONSERVATION RANKING: S5
RANK JUSTIFICATION: Minor to incidental type widespread throughout Alberta (Thompson and Hansen 2002). NatureServe (2003) assigned this type a G5 ranking.
PLOT NUMBERS: 30

REFERENCES:
NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2.8 Salix amygdaloides Shrubland
Peach-leaved Willow Shrubland

DESCRIPTION:
This type is incidental in the Dry Mixedgrass Subregion of southeastern Alberta (Thompson and Hansen 2002). It grows in narrow bands and patches in backwater areas, abandoned side channels and other riparian areas. In WOSPP, this type is uncommon and is restricted to a few isolated stands. Soils have various textures but are typically Regosols and Chernozems. Water tables are usually within 1 m of the soil surface throughout the growing season (Thompson and Hansen 2002). Individual *Populus deltoides* trees may occur at low percent cover in this type. Dominant shrub species include *Salix amygdaloides, Salix lutea, Symphoricarpos occidentalis, Rosa spp., Cornus sericea,* and *Shepherdia argentea.* The herb layer has a diversity of species including dominants such as *Agropyron smithii, Glycyrrhiza lepidota, Melilotus alba, Poa palustris, Phalaris arundinacea,* and *Equisetum arvense.*

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Mesic Riparian Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Salix amygdaloides* Shrubland Alliance
ASSOCIATION: ***Salix amygdaloides* Shrubland**
UNIQUE IDENTIFIER: NatureServe CEGL000947; Alberta CEGL000947
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Salix amygdaloides, Salix lutea, Symphoricarpos occidentalis, Pascopyrum smithii, Glycyrrhiza lepidota, Melilotus alba, Poa palustris, Phalaris arundinacea*
CO-DOMINANT SPECIES: *Rosa spp., Cornus sericea, Shepherdia argentea, Melilotus officinalis, Equisetum arvense, Lycopus asper, Cicuta maculata, Aster* spp., *Potentilla* spp., *Smilacina stellata*
DIAGNOSTIC SPECIES: *Salix amygdaloides, Cornus sericea, Salix lutea, Poa palustris*

PROPOSED PROVINCIAL CONSERVATION RANKING: S1S2
RANK JUSTIFICATION: Incidental in the Dry Mixedgrass Subregion of southeastern Alberta (Thompson and Hansen 2002). Type is listed as S1S2 provincially (Allen 2003) and G3 globally (NatureServe 2003). Appears to be uncommon in WOSPP.
PLOT NUMBERS: 78

REFERENCES:
Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2.9 ***Salix lutea - Cornus sericea* Shrubland**
Yellow Willow - Red Osier Dogwood Shrubland

DESCRIPTION:
Thompson and Hansen (2002) identify this as a minor to incidental type in the Mixedgrass Natural Region. It occurs as dense bands on stream floodplains along major rivers. Soils are typically dark brown to black Chernozems grading to Organics and textures are generally clay loam to sandy loam. Water tables are generally within 1 m of the soil surface. Other dominant shrub species include *Cornus sericea, Rosa spp., Salix exigua*, and *Symphoricarpos occidentalis*. In the herbaceous layer dominants include *Elymus lanceolatus, Viola canadensis, Galium boreale, Carex sprengelii, Bromus inermis, Pascopyrum smithii, Smilacina stellata,* and *Sonchus asper*. In the one plot completed in WOSPP (Figure 1), *Salix lutea* dominated the shrub layer (40% cover) followed by *Shepherdia argentea* (20%) and *Symphoricarpos occidentalis* (5%). There was no cover of *Cornus sericea* recorded at this site. The herbaceous layer consisted of *Urtica dioica, Iva xanthifolia, Bromus tectorum, Melilotus albus, Phalaris arvense* and *Nepeta cataria*. Thompson and Hansen (2002) indicate that heavily grazed communities will change to a grazing disclimax *Salix lutea* Community Type. The WOSPP plot had characteristics of both communities but appeared to be more similar to the *Salix lutea - Cornus sericea* Shrubland Community.

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Intermittently Flooded Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Salix lutea* Shrubland Alliance
ASSOCIATION: ***Salix lutea - Cornus sericea* Shrubland**
UNIQUE IDENTIFIER: Alberta CEAB000168
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Moderately good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Salix lutea, Cornus sericea, Elymus lanceolatus, Viola canadensis, Galium boreale*

CO-DOMINANT SPECIES: *Salix exigua, Symphoricarpos occidentalis, Rosa spp., Carex sprengelii, Bromus inermis, Pascopyrum smithii, Smilacina stellata, Sonchus asper*

DIAGNOSTIC SPECIES: *Salix lutea, Cornus sericea, Symphoricarpos occidentalis, Rosa spp, Bromus inermis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3?
RANK JUSTIFICATION: Same ranking as Allen (2003). NatureServe (2003) does not list this type but includes a *Salix lutea / Carex utriculata* type (G4) and a *Salix lutea / Calamagrostis canadensis* type (G3?).
PLOT NUMBERS: 59

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.2.10 ***Symphoricarpos occidentalis*** **Shrubland**
Buckbrush Shrubland

DESCRIPTION:
This type is wide spread at low to mid elevation sites throughout Alberta. It forms dense patches on alluvial floodplain terraces along streams and rivers, ravines and swales, and hillside locations that provide additional moisture from seeps or springs (Thompson and Hansen 2002). Other associated shrubs include *Juniperus horizontalis, Rosa spp.* and *Ribes aureum*. The herb layer is very diverse and is dominated by *Poa pratensis, Bromus inermis, Pascopyrum smithii, Carex lanuginosa, Cirsium arvense, Achillea millefolium, Artemisia ludoviciana,* and *Glycyrrhiza lepidota*. The three plots completed in WOSPP (Figure 2) were dominated by *Symphoricarpos occidentalis* (57 - 69% cover) in association with *Rosa* spp. (0-7%), *Poa pratensis* (2-29%), and *Cirsium arvense* (0-40%).

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Low Temperate or Subpolar Cold-deciduous Shrubland
ALLIANCE: *Symphoricarpos occidentalis* Shrubland Alliance
ASSOCIATION: ***Symphoricarpos occidentalis*** **Shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Symphoricarpos occidentalis, Juniperus horizontalis, Rosa spp., Poa pratensis*
CO-DOMINANT SPECIES: *Poa compressa, Bromus inermis, Pascopyrum smithii, Carex lanuginosa, Cirsium arvense, Achillea millefolium, Artemisia ludoviciana,* and *Glycyrrhiza lepidota.*
DIAGNOSTIC SPECIES: *Symphoricarpos occidentalis, Rosa spp, Poa pratensis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4S5
RANK JUSTIFICATION: Common and widespread type in WOSPP. Is also common throughout Alberta (Thompson and Hansen 2002). NatureServe (2003) lists a *Symphoricarpos occidentalis* Shrubland Type, from Manitoba and Saskatchewan as G4G5.
PLOT NUMBERS: 40,51,80

REFERENCES:
Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

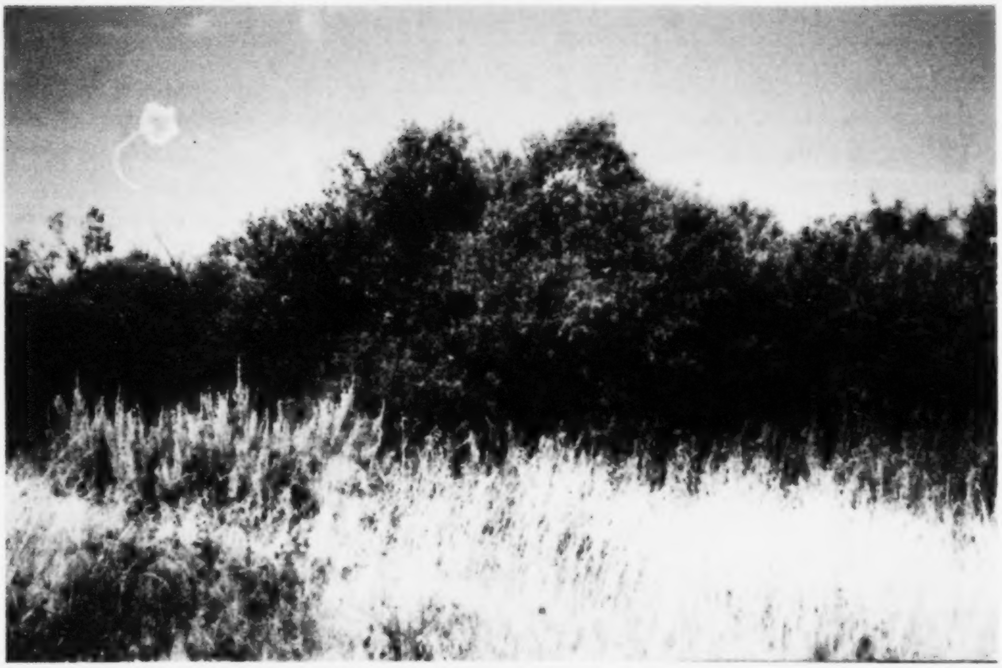

Figure 1. *Salix lutea - Cornus sericea* Shrubland located in the Milk River riparian zone.

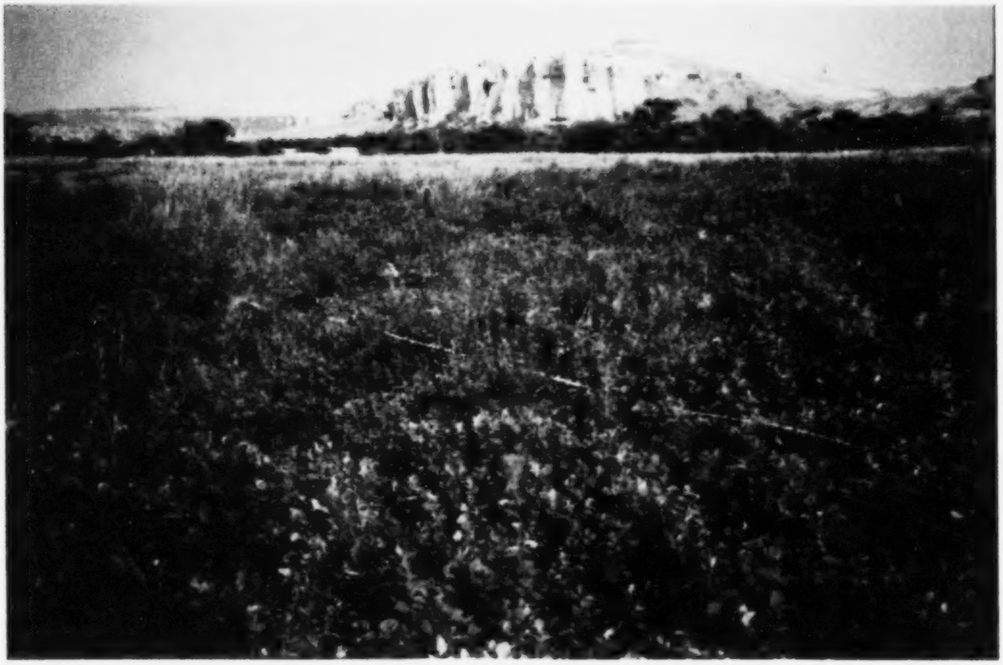

Figure 2. *Symphoricarpos occidentalis* Shrubland located in the Milk River riparian zone.

3.2.3 HERBACEOUS VEGETATION

3.2.3.1 Artemisia cana / Stipa viridula - Pascopyrum smithii Shrub Herbaceous Vegetation

Silver sagebrush / Green needle grass - Western wheat grass Shrubland

DESCRIPTION:

Weerstra (2001) and Allen (2003) provide reviews of this type and plots completed in WOSPP (n=2) were considered a good fit although *Artemisia cana* cover was low. Plots completed on the current study indicated that sites include low areas within shallow depressions on north to east facing slopes (20-50%) and shallow gullies (Figure 3). These sites are well drained with soils that have submesic moisture levels and submesotrophic (poor) nutrient regimes. Surface substrates are predominately organic but mineral soil accounts for 30-40% of the ground cover. In WOSPP, *Artemisia cana* is the dominant shrub (12-26% cover) and is associated with *Rhus trilobata* (1-4%), and *Symphoricarpos occidentalis* (1-2%). *Stipa viridula* (20-22%) is the dominant grass along with *Pascopyrum smithii* (6-14%). Other important herbaceous species include *Elymus lanceolatus, Koeleria macrantha, Calamovilfa longifolia, Linum lewisii, Artemisia ludoviciana, Hesperostipa comata, Liatris punctata, Artemisia frigida, Tragopogon dubius, Phlox hoodii,* and *Bouteloua gracilis.*

The WOSPP type is similar to the *Artemisia cana / Agropyron smithii* Habitat Type described by Thompson and Hansen (2002) and NatureServe (2003) (see CEGL001072). However, the *Artemisia cana / Agropyron smithii* type occupies nearly level older alluvial terraces in floodplains and coalescing alluvial fans within valleys. Average cover of the dominant species also differs with more *Artemisia cana* (39%), *Pascopyrum smithii* (68%), and less *Stipa viridula* (7%).

CLASS: Shrubland
SUBCLASS: Herbaceous Vegetation
GROUP: Perennial Graminoid Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Medium-tall Temperate or Subpolar Grassland with a sparse Needle-leaved Microphyllous Evergreen Shrub Layer
ALLIANCE: *Artemisia cana* Shrub Herbaceous Alliance
ASSOCIATION: ***Artemisia cana / Stipa viridula - Pascopyrum smithii* Shrub Herbaceous Vegetation**
UNIQUE IDENTIFIER: Alberta CEAB000157
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Artemisia cana, Stipa viridula, Pascopyrum smithii*
CO-DOMINANT SPECIES: *Rhus trilobata, Symphoricarpos occidentalis, Elymus lanceolatus, Koeleria macrantha, Calamovilfa longifolia, Linum lewisii, Artemisia ludoviciana, Hesperostipa comata, Liatris punctata, Artemisia frigida, Tragopogon dubius, Phlox hoodii,* and *Bouteloua gracilis.*
DIAGNOSTIC SPECIES: *Artemisia cana, Stipa viridula, Pascopyrum smithii, Koeleria macrantha, Artemisia frigida*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: Same Ranking as Allen (2003).
PLOT NUMBERS: 5,19

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

Weerstra, A.C. 2001. Preliminary classification of silver sagebrush (Artemisia cana) community types. Prep. For Alberta Natural Heritage Information Centre. Prep. By Biota Consultants, Cochrane, AB

3.2.3.2 ***Artemisia cana / Hesperostipa comata*** **Shrub Herbaceous Vegetation**

Silver sagebrush / Needle-and-thread grass Shrubland

Weerstra (2001) and Allen (2003) reported this type as being wide spread throughout the Dry Mixedgrass Subregion of Alberta. NatureServe (2003) also indicates that it is a type that occupies the northwestern Great Plains. It occurs on well to rapidly drained sites that are level to gently sloped with variable aspects. Commonly it occupies benches and gentle slopes near breaklands, old river terraces, badlands, ravine side slopes and valley walls. Generally, soils are loam, sand, and sandy loam textured Orthic Brown Chernozems derived from glacial drift and alluvium. This type is fairly common in the Milk River floodplain occurring on gentle slopes (e.g. 30 %) with well-drained soils (Figure 4). Moisture regimes are subxeric and nutrient regimes are mesotrophic (medium). Mineral soil accounts for approximately 40% of the surface substrate. The two plots completed in WOSPP had similar site conditions but one plot occurred on lower slope position (#47) while the other was situated on an easterly facing upper slope (#52). *Artemisia cana* cover at these plots ranged from 8 to 24% and *Hesperostipa comata* (37-57%) dominated the herbaceous layer. Other important species included *Elymus lanceolatus, Pascopyrum smithii, Bouteloua gracilis, Artemisia frigida, Koeleria macrantha, Carex spp., Opuntia polyacantha, Heterotheca villosa*, and *Sphaeralcea coccinea*.

CLASS: Shrubland
SUBCLASS: Herbaceous Vegetation
GROUP: Perennial Graminoid Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Medium-tall Temperate or Subpolar Grassland with a sparse Needle-leaved Microphyllous Evergreen Shrub Layer
ALLIANCE: *Artemisia cana* Shrub Herbaceous Alliance
ASSOCIATION: ***Artemisia cana / Hesperostipa comata*** **Shrub Herbaceous Vegetation**
UNIIQUE IDENTIFIER: NatureServe CEGL001553, Alberta CEAB000096
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Artemisia cana, Hesperostipa comata*
CO-DOMINANT SPECIES: *Bouteloua gracilis, Koeleria macrantha, Pascopyrum smithii, Carex spp., Artemisia frigida, Poa sandbergii, Opuntia polyacantha, Heterotheca villosa, Sphaeralcea coccinea,*
DIAGNOSTIC SPECIES: *Artemisia cana, Hesperostipa comata*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: Same ranking as Allen (2003). NatureServe (2003) ranks this type as G3.
PLOT NUMBERS: 47,52

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Weerstra, A.C. 2001. Preliminary classification of silver sagebrush (Artemisia cana) community types. Prep. For Alberta Natural Heritage Information Centre. Prep. By Biota Consultants, Cochrane, AB.

3.2.3.3 ***Phalaris arundinacea*** **Herbaceous Vegetation**

Reed Canary Grass Herbaceous Vegetation

DESCRIPTION:

Thompson and Hansen (2002) indicated this type forms small dense monocultures in valley bottom locations along streams, oxbows, and wet meadow areas. Soils are generally fine textured Regosols or less commonly Chernozems. Sites are typically flooded annually and soils remain saturated throughout the growing season. Thompson and Hansen (2002) indicated associated plant species in this type include *Mentha arvensis, Cirsium arvense, Carex atherodes*, and *Salix exigua.* At the one plot completed in WOSPP *Phalaris arundinacea* formed a monoculture (85% cover) and no other species were recorded (Figure 5).

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Seasonally Flooded Temperate or Subpolar Perennial Tall Graminoid Herbaceous Vegetation
ALLIANCE: *Phalaris arundinacea* Herbaceous Alliance
ASSOCIATION: ***Phalaris arundinacea*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: NatureServe CEGL001474
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Phalaris arundinacea*
CO-DOMINANT SPECIES: *Symphoricarpos occidentalis*, *Mentha arvensis, Cirsium arvense, Carex atherodes*, and *Salix exigua.*
DIAGNOSTIC SPECIES: *Phalaris arundinacea*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4
RANK JUSTIFICATION: Common in WOSPP and is a minor type found throughout Alberta (Thompson and Hansen 2002). This type is ranked as G5 by Nature Serve (2003).
PLOT NUMBERS: 57

REFERENCES:

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Dec.22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

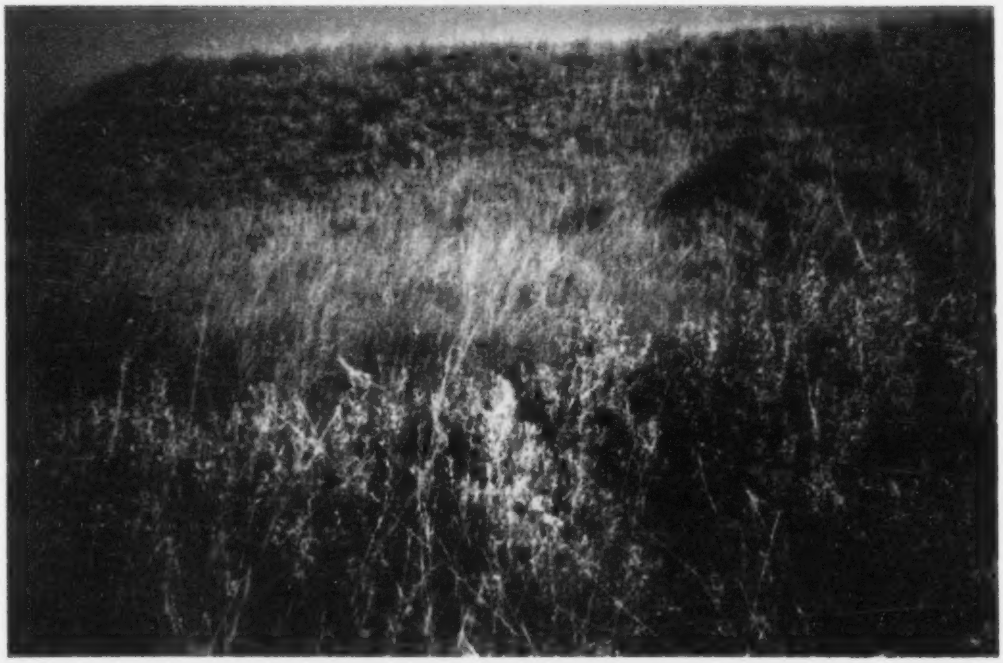

Figure 3. *Artemisia cana / Stipa viridula - Pascopyrum smithii* Shrub Herbaceous Vegetation type.

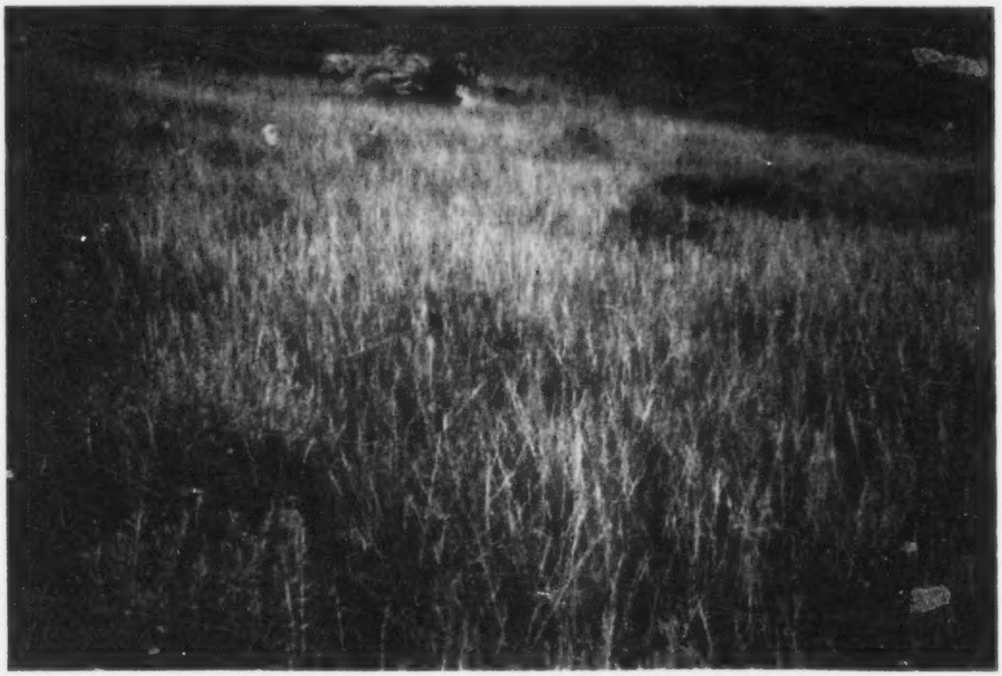

Figure 4. *Artemisia cana / Hesperostipa comata* Shrub Herbaceous type.

3.2.3.4 ***Calamagrostis stricta - Calamagrostis inexpansa*** **Herbaceous Vegetation**

Narrow reed grass - Northern reed grass Herbaceous Vegetation

DESCRIPTION:

Thompson and Hansen (2002) describe a *Calamagrostis stricta* Community Type that inter-grades with a *Calamagrostis inexpansa* type where one or both species may occur. This is an incidental type found at low to mid elevations in Alberta. In WOSPP, this type was observed in the Van Cleeve and Police Creek drainages (Figure 6). It typically occurs in wet meadows, basins, slightly saline depressions and alluvial terraces. Other graminoids associated with this type are *Juncus balticus, Poa palustris* and *Hordeum jubatum*. Common forbs include *Mentha arvense, Potentilla anserina*, and *Sonchus spp.* with lesser amounts of *Polygonum amphibium, Cirsium arvense* and *Fragaria virginiana*. Soils originate from coarse textured alluvial parent materials, however, soils textures are commonly clay loam to sand. Moisture regimes are moderate to high and the soil is moist through most of the growing season. *Juncus balticus, Hordeum jubatum*, or *Poa palustris* may dominate heavily disturbed sites and forb cover is often higher as well. At the one plot completed in WOSPP *Calamagrostis inexpansa* cover dominated at 85% and other species included *Mentha arvensis* (37.5%), *Cirsium arvense* (15%), *Potentilla anserina* (15%), and *Helianthus nuttallii* (15%).

De Vries (1968) briefly described a similar minor type occupying periodically inundated river flats and stream banks. Dominant species in this type included *Calamagrostis inexpansa, Elymus canadensis, Poa compressa,* and *Sphenopholis obtusata* (Prairie wedge grass).

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Seasonally Flooded Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Calamagrostis stricta* Herbaceous Alliance
ASSOCIATION: ***Calamagrostis stricta - Calamagrostis inexpansa*** **Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Calamagrostis inexpansa, Calamagrostis stricta, Juncus balticus, Poa palustris, Hordeum jubatum*
CO-DOMINANT SPECIES: *Potentilla anserina, Mentha arvense, Polygonum amphibium, Sonchus* spp., *Cirsium arvense, Fragaria virginiana*
DIAGNOSTIC SPECIES: *Calamagrostis inexpansa, Calamagrostis stricta, Juncus balticus, Hordeum jubatum.*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4S5
RANK JUSTIFICATION: Incidental type in southern Alberta wet areas (Thompson and Hansen 2002).
PLOT NUMBERS: 55

REFERENCES:

De Vries, B. 1968. A preliminary botanical investigation of Writing-On-Stone Provincial Park in Southern Alberta. The Blue Jay. Pages 41-53

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

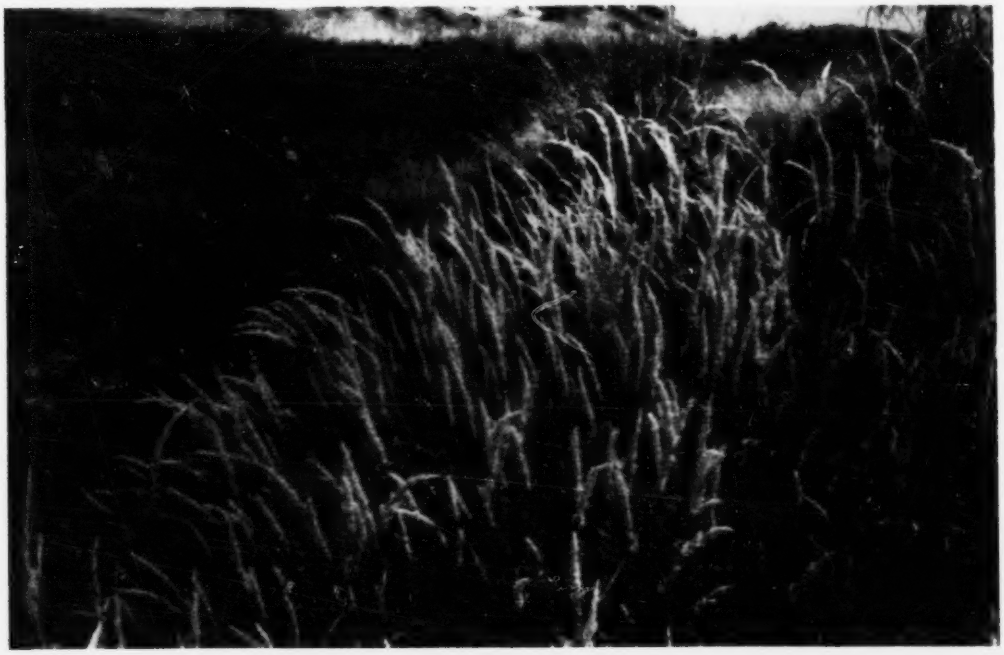

Figure 5. *Phalaris arundinacea* Herbaceous Vegetation type.

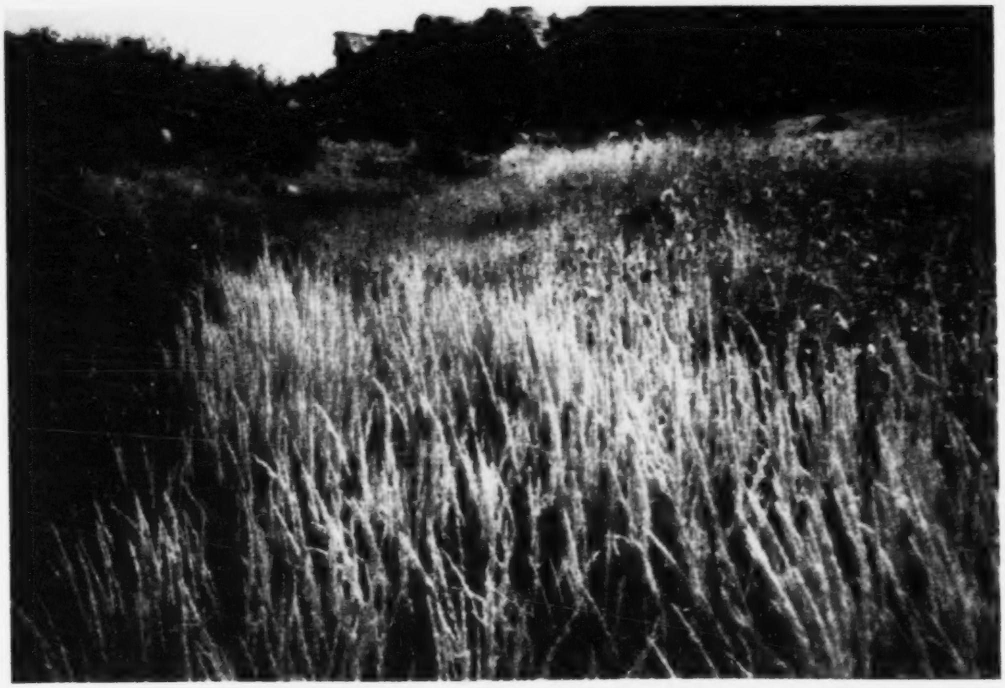

Figure 6. *Calamagrostis stricta – Calamagrostis inexpansa* Herbaceous Vegetation type.

3.2.3.5 ***Glycyrrhiza lepidota*** **Herbaceous Vegetation**
Wild Licorice Herbaceous Vegetation

DESCRIPTION:

Thompson and Hansen (2002) identify this community as a minor type occurring in low elevation riparian or wetland areas in southern Alberta. It is associated with sloping banks, low terraces and recent alluvial deposits adjacent to streams and rivers. Soils are typically Regosols ranging from clay loam to sandy loam textures. Water tables are near the soil surface in spring then dropping as the season progresses. Thompson and Hansen (2002) list common species in this type to include *Symphoricarpos occidentalis, Rosa spp., Bromus inermis, Pascopyrum smithii, Juncus balticus,* and *Elymus canadensis.* At the one site sampled in WOSPP soils moisture levels were mesic and nutrient regimes were recorded as mesotrophic (Figure 7). This was a level site that was moderately well drained and had 50% mineral soil cover. *Glycyrrhiza lepidota* was the dominant cover (65%) and was associated with *Equisetum arvense* (48%) at this site.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Rich Mesic Temperate or Subpolar Perennial Herbaceous Vegetation
ALLIANCE: *Glycyrrhiza lepidota* Herbaceous Alliance
ASSOCIATION: ***Glycyrrhiza lepidota*** **Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Occurs within the known geographical range, site data matches previously described type, and *Glycyrrhiza lepidota* was clearly the dominant species.

DOMINANT SPECIES: *Glycyrrhiza lepidota*
CO-DOMINANT SPECIES: *Symphoricarpos occidentalis, Rosa* spp., *Bromus inermis, Hordeum jubatum, Pascopyrum smithii, Elymus canadensis, Equisetum arvense, Juncus balticus, Solidago gigantea, Elymus trachycaulus*
DIAGNOSTIC SPECIES: *Glycyrrhiza lepidota, Bromus inermis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3S4
RANK JUSTIFICATION: Thompson and Hansen (2002) identify this as a minor type in Southern Alberta although it appears to be relatively common in WOSPP. ANHIC (2002) ranked the species, *Glycyrrhiza lepidota,* as S4 in Alberta. NatureServe (2003) currently has no listing of this plant association type.
PLOT NUMBERS: 6

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.3.6 ***Hordeum jubatum*** **Herbaceous Vegetation**
Foxtail Barley Herbaceous Vegetation

DESCRIPTION:

This type is incidental in the riparian zone and wetland areas of the Dry Mixedgrass Subregion(Thompson and Hansen 2002). NatureServe (2003) indicates that this is a poorly defined type that occurs in the northern and central Great Plains including occurrences in Saskatchewan. It occurs at low elevations often as as narrow bands in drawdown zones of lakes, ponds, or ephemeral depressions with moderately saline or alkali water (Thompson and Hansen 2002, NatureServe 2003). Soils tend to be fine textured and poorly to very poorly drained with the water table remaining at or slightly below ground level through the growing season. Although *Hordeum jubatum* cover is dominant (40-94%), a variety of other disturbance related species are associated with this type including *Pascopyrum smithii, Puccinellia nuttalliana, Atriplex prostrata, Chenopodium fremontii,* and *Descurainia pinnata* (Thompson and Hansen 2002). Plant species recorded in WOSPP (n=1) for this type, with approximate percent covers, included *Hordeum jubatum* (85%), *Sonchus arvensis* (15%), *Phalaris arundinacea* (15%), and *Bromus inermis* (3%).

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Alkali-tolerant Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Hordeum jubatum* Herbaceous Alliance
ASSOCIATION: ***Hordeum jubatum*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: NatureServe CEGL001798
CLASSIFICATION CONFIDENCE LEVEL: 1 (Moderate) *Hordeum jubatum* is dominant, good correlation of site data with the published literature, and occurs within the known geographical range.

DOMINANT SPECIES: *Hordeum jubatum*
CO-DOMINANT SPECIES: *Pascopyrum smithii, Puccinellia nuttalliana, Atriplex prostrata, Chenopodium fremontii, Descurainia pinnata, Sonchus arvensis, Phalaris arundinacea, Bromus inermis*
DIAGNOSTIC SPECIES: *Hordeum jubatum*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4
RANK JUSTIFICATION: Incidental type at low elevations in southeastern Alberta (Thompson and Hansen 2002). NatureServe (2003) ranks this type as G4 globally indicating that it is distributed throughout the northern and central Great Plains ranging from Saskatchewan to Colorado.
PLOT NUMBERS: 75

REFERENCES:

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.3.7 ***Schoenoplectus pungens*** **Herbaceous Vegetation**
Three-square Rush Herbaceous Vegetation

DESCRIPTION:
This is a minor type throughout southern Alberta that is common in wet areas along streams or around small open water bodies (Thompson and Hansen 2002). Soils are commonly poorly drained Humic Gleysols ranging in texture between clay and loam. They are most often alkaline and less frequently saline. The water table at these sites is often less than 1 m below ground surface level. The dominant plant species is *Schoenoplectus pungens* with minor amounts of *Salix exigua, Calamagrostis stricta, Eleocharis acicularis,* and *Hordeum jubatum* (Thompson and Hansen 2002). At the two plots completed in WOSPP *Schoenoplectus pungens* cover ranged from 45% to 85% (Figure 8). Other species recorded at these sites included *Mentha arvense, Carex siccata, Juncus balticus, Potentilla anserina, Spartina gracilis* and X *Agrohordeum macounii.*

According to Thompson and Hansen (2002), *Schoenoplectus pungens* is an early coloniser of wet areas and tends to grow aggressively resulting in displacement of other species. Heavy disturbance, such as caused by grazing, can cause a shift in species composition to *Hordeum jubatum* and *Juncus balticus.*

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Grassland
SUBGROUP: Natural/Semi-natural
FORMATION: Semi-permanently Flooded Temperate or Subpolar Grassland
ALLIANCE: *Schoenoplectus pungens* Herbaceous Alliance
ASSOCIATION: ***Schoenoplectus pungens*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: NatureServe CEGL001587
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) *Schoenoplectus pungens* is dominant, good correlation of site data with the published literature, and occurs within the known geographical range.

DOMINANT SPECIES: *Schoenoplectus pungens*

CO-DOMINANT SPECIES: *Salix exigua, Calamagrostis stricta, Eleocharis acicularis, Hordeum jubatum, Mentha arvense, Carex siccata, Juncus balticus, Potentilla anserina, Spartina gracilis*

DIAGNOSTIC SPECIES: *Schoenoplectus pungens*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3S4
RANK JUSTIFICATION: *Schoenoplectus pungens* is listed as S4 in Alberta (ANHIC 2002). Minor community type throughout southern Alberta (Thompson and Hansen 2002). NatureServe (2003) lists this type as G3G4 describing it as widespread through the western Great Plains including Montana.
PLOT NUMBERS: 50,56

REFERENCES:
ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

Figure 7. *Glycyrrhiza lepidota* Herbaceous Vegetation type located along Police Creek.

Figure 8. *Schoenoplectus pungens* Herbaceous Vegetation type.

3.2.3.8 ***Juncus balticus*** **Herbaceous Vegetation**
Wire Rush Herbaceous Vegetation

DESCRIPTION:

The *Juncus balticus* community type is widespread throughout wetlands in western North America (NatureServe 2003). Thompson and Hansen (2002) report that this community is an incidental type at low to mid elevations throughout Alberta. It is a grazing disclimax community that is associated with seepage areas, wet meadows and alluvial terraces. Tolerant to grazing, it invades grazed sites displacing *Deschampsia cespitosa* and *Carex aquatilis* (Thompson and Hansen 2002). *Juncus balticus* generally forms monocultures although other species may include *Hordeum jubatum, Senecio indecorus, Poa palustris, Poa pratensis, Cardamine pratensis, Epilobium glaberrimum, Mentha arvensis,* and *Triglochin maritima.* A variety of other native and non-native invasive species are also associated with this type. At the one plot completed in WOSPP *Juncus balticus* was the dominant cover (63%) and was associated with *Sonchus arvensis* (15%), *Cirsium arvense* (15%) and *Poa pratense* (<1%).

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Grassland
SUBGROUP: Natural/Semi-natural
FORMATION: Seasonally flooded Temperate or Subpolar Grassland
ALLIANCE: *Juncus balticus* Herbaceous Alliance
ASSOCIATION: ***Juncus balticus*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: NatureServe CEGL001838
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Juncus balticus*
CO-DOMINANT SPECIES: *Hordeum jubatum, Senecio indecorus, Poa palustris, Poa pratensis, Cardamine pratensis, Epilobium glaberrimum, Mentha arvensis, Triglochin maritima*
DIAGNOSTIC SPECIES: *Juncus balticus*

PROPOSED PROVINCIAL CONSERVATION RANKING: S5
RANK JUSTIFICATION: *Juncus balticus species* is listed as S5 in Alberta (ANHIC 2002). The community type is incidental in wet areas throughout Alberta (Thompson and Hansen 2002) and is widespread through western North America (NatureServe 2003).
PLOT NUMBERS: 74

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.3.9 ***Calamovilfa longifolia - Hesperostipa comata*** **Herbaceous Vegetation**

Sand Grass - Needle-and-thread grass

This community type occurs as small patches but is widespread in the Dry Mixedgrass Natural Subregion and through the central to northern Great Plains of the USA (Allen 2003, NatureServe 2003). Adams et al. (1997) described this type for the Canadian Forces Base at Suffield, Alberta. There it occurred on well drained sandy to sandy loam soils, on complex terrain with variable aspects and gentle sloped sites. *Calamovilfa longifolia* cover ranges from 20-40% and *Hesperostipa comata* cover is commonly 15-30%. Other important species include *Rosa woodsii, Artemisia frigida, Bouteloua gracilis* and *Koeleria macrantha*. *Carex spp.* are usually absent but *Carex stenophylla* may occur with significant cover.

In WOSPP (n=3), this type occurs in well-defined easily recognisable patches that are widespread throughout the Park (Figure 9). Each stand covers from a few to over 100 m^2 in size and these are typically located on gentle upper slope to crest positions. Soils are well to moderately well drained, with xeric to subxeric moisture levels and submesotrophic (poor) to mesotrophic (medium) nutrient regimes. Surface substrates have relatively high mineral soil cover (30-40%). At the plots completed in the Park *Calamovilfa longifolia* cover averaged 32.6% (30.8-35.5% range) and *Hesperostipa comata* cover was low averaging 5.4% (0-8.3% range). The small size of the patches sampled and considerable influence by surrounding community types resulted in high variability in floristic composition of these stands. It was noted that although the co-dominant species, *Hesperostipa comata,* was not recorded within the Daubenmire subplots ($1m^2$ total area) at Plot #9 it was recorded as incidental data within the 100 m^2 macroplot completed in conjunction with the Daubenmire plots.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Grassland
SUBGROUP: Natural/Semi-natural
FORMATION: Tall sod Temperate or Subpolar Grassland
ALLIANCE: *Calamovilfa longifolia* Herbaceous Alliance
ASSOCIATION: ***Calamovilfa longifolia - Hesperostipa comata*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: NatureServe CEGL001473, Alberta CEAB000098
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) *Calamovilfa longifolia* cover was high at all plots and was associated with *Hesperostipa comata*. Other plot data appeared to with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Calamovilfa longifolia, Hesperostipa comata, Liatris punctata*
CO-DOMINANT SPECIES: *Rosa woodsii, Artemisia frigida, Bouteloua gracilis, Koeleria macrantha, Carex stenophylla, Linum lewisii, Carex filifolia, Tragopogon dubius, Thermopsis rhombifolia, Anemone multifida, Muhlenbergia cuspidata, Astragalus striatus, Comandra umbellatum*
DIAGNOSTIC SPECIES: *Calamovilfa longifolia, Hesperostipa comata, Koeleria macrantha, Liatris punctata, Artemisia frigida, Carex filifolia*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3
RANK JUSTIFICATION: Although widespread individual communities appear to have limited areal extent. Type is presently ranked as S3 in Alberta (Allen 2003). NatureServe (2003) lists this type as G3 globally.
PLOT NUMBERS: 9,12,41

REFERENCES:

Adams, G.D., G.C. Trottier, W.L. Strong, I.D. MacDonald, S.J. Barry, P.G Gregoire, G.W. Babish and G.Weiss. 1997. Vegetation component report. Canadian Forces Base Suffield National Wildlife Area Wildlife Inventory. Canadian Wildlife Service, Environment Canada, Edmonton, Alberta.

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

3.2.3.10 ***Pascopyrum smithii - Bouteloua gracilis*** **Herbaceous Vegetation**

Western Wheat - Blue grama grass Herbaceous Vegetation

DESCRIPTION:

This type is summarised by Allen (2003), and Vujnovic and Bentz (2001), as a community that occurs on well drained Brown Solonetz and Brown Solodized Solonetz soils. Less frequently found on Orthic Brown Chernozems with loam and clay loam textures that occur on gentle slopes and undulating moraines. Important plant species are listed as *Pascopyrum smithii* (28%) *Poa sandbergii* (13%), *Koeleria macrantha* (7%), *Hesperostipa comata* (4%), *Bouteloua gracilis* (4%), and *Selaginella densa* (29%). Surface substrates have high mineral soil cover (40%). The one site sampled in WOSPP was located on a moderately heavily grazed area in the Milk River floodplain. Soils were well drained with xeric moisture and mesotrophic (medium) nutrient regimes. Dominant plant species were *Pascopyrum smithii* (35%) and *Bouteloua gracilis* (17%) with lesser amounts of *Sphaeralcea coccinea* (3%), *Artemisia frigida* (3%) *Tragopogon dubius* (2%) and *Hesperostipa comata* (1%). This type is relatively common in WOSPP and occurs typically in association with dry south facing sites in the hoodoos and on the Milk River floodplains on the south side of the river.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Grassland
SUBGROUP: Natural/Semi-natural
FORMATION: Medium-tall sod Temperate or Subpolar Grassland
ALLIANCE: *Pascopyrum smithii* Herbaceous Alliance
ASSOCIATION: ***Pascopyrum smithii - Bouteloua gracilis*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: NatureServe CEGL001578, Alberta CEAB000138
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) High plant species variability in the *Bouteloua gracilis* types within WOSPP. Dominant species were present but other diagnostic species were not recorded at the one plot sampled.

DOMINANT SPECIES: *Pascopyrum smithii, Bouteloua gracilis, Selaginella densa,*
CO-DOMINANT SPECIES: *Poa sandbergii, Sphaeralcea coccinea, Artemisia frigida, Hesperostipa comata, Koeleria macrantha, Tragopogon dubius*
DIAGNOSTIC SPECIES: *Pascopyrum smithii, Bouteloua gracilis, Selaginella densa, Hesperostipa comata, Koeleria macrantha*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3?
RANK JUSTIFICATION: Previously ranked as S1 in Alberta (Allen 2003). NatureServe (2003) ranks this type as S5 globally and indicates its range is uncertain but that it does occurs in the southern Great Plains.
PLOT NUMBERS: 84

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Vujnovic, K. and J. Bentz. 2001. Preliminary classification of native wheat grass (Agropyron spp.) community types in Alberta. Prep for. Alberta Natural Heritage Information Centre, Edmonton, AB. Prep by. Geowest Environmental Consultants Ltd., Edmonton, AB

3.2.3.11 ***Pascopyrum smithii - Hesperostipa comata - Bromus tectorum*** **Herbaceous Vegetation**
Western Wheat - Green needle grass - Downy chess grass Herbaceous Vegetation

DESCRIPTION:

According to Cornish (1996), this upland type occurs on or adjacent to previously cultivated lands with loamy Orthic Dark Brown and Brown Chernozemic soils. It is a wheat grass dominated community invaded by *Bromus tectorum* and other introduced species such as *Taraxacum officinale, Bromus inermis* and *Agropyron pectiniforme*. On the one plot completed during the current study this type was found on a steep slope where soils are rapidly drained with subxeric moisture levels and mesotrophic nutrient regimes. The shrub layer is very sparse but may include minor amounts of *Artemisia cana*, and *Symphoricarpos occidentalis*. The herbaceous layer is diverse and is dominated by *Pascopyrum smithii, Hesperostipa comata, Bromus tectorum* and *Koeleria macrantha*. Associated species include *Carex stenophylla, Poa palustris, Artemisia frigida, Taraxacum officinale, Selaginella densa* and *Vicia americana*. Other occasional species include *Poa sandbergii, Festuca saximontana, Elymus trachycaulus, Bromus inermis, Agropyron pectiniforme, Phlox hoodii, Sphaeralcea coccinea, Plantago patagonica, Grindelia squarrosa, Tragopogon dubius* and others. This type may be similar to the *Pascopyrum smithii - Hesperostipa comata - Bouteloua* gracilis Herbaceous Vegetation described by Vujnovic and Bentz (2001). However, although there is relatively good correlation between most of the dominant and associated species *Bouteloua gracilis* was not recorded at the WOSPP plots.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Submesic Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Pascopyrum smithii* Herbaceous Alliance
ASSOCIATION: ***Pascopyrum smithii - Hesperostipa comata - Bromus tectorum*** **Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Limited plot data to fully establish the type and it appears to grade into other similar community types. Occurs within the known geographical range.

DOMINANT SPECIES: *Pascopyrum smithii, Hesperostipa comata, Bromus tectorum, Koeleria macrantha*
CO-DOMINANT SPECIES: *Artemisia cana, Symphoricarpos occidentalis, Carex stenophylla, Poa palustris, Artemisia frigida, Taraxacum officinale, Selaginella densa, Vicia americana, Poa sandbergii, Festuca saximontana, Elymus trachycaulus, Bromus inermis, Agropyron pectiniforme, Phlox hoodii, Sphaeralcea coccinea, Grindelia squarrosa, Tragopogon dubius*
DIAGNOSTIC SPECIES: *Pascopyrum smithii, Hesperostipa comata, Bromus tectorum, Koeleria macrantha, Carex stenophylla, Poa palustris, Artemisia frigida, Taraxacum officinale, Selaginella densa, Vicia americana*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2?
RANK JUSTIFICATION: Appears to be fairly common in WOSPP but prevalence outside of the Park in not known. Allen (2003) ranked the similar *Pascopyrum smithii - Hesperostipa comata - Bouteloua gracilis* type as S2S3.
PLOT NUMBERS: 66

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

Vujnovic, K. and J. Bentz. 2001. Preliminary classification of native wheat grass (Agropyron spp.) community types in Alberta. Prep for. Alberta Natural Heritage Information Centre, Edmonton, AB. Prep by. Geowest Environmental Consultants Ltd., Edmonton, AB

3.2.3.12 ***Pascopyrum smithii*** **Herbaceous Vegetation**
Western Wheat grass Herbaceous Vegetation

DESCRIPTION:

This type is the equivalent to a late seral to climax *Pascopyrum smithii* Herbaceous Vegetation type and is considered to be a minor riparian plant community type in southeastern Alberta (Thompson and Hansen 2002). It occupies shallow depressional sites and level alluvial fan positions in which surface runoff or soil textures enhance moisture levels. Soils are typically fine textured clay to silt loams that are moderately well drained, with sub-mesic moisture levels, and mesotrophic (medium) nutrient regimes. Most soils are neutral to moderately alkaline but may be saline. Vujnovic and Bentz (2001) completed an analysis and literature review of this type and reported that it occurs in swales and depressional sites with moderately well to imperfectly drained soils. Typically soils are Brown Solonetz, Brown Solodized Solonetz and Brown Solods with clay and loam textures. Based on the literature and the one plot completed in WOSPP, *Pascopyrum smithii* often forms a monoculture but other minor species may include *Stipa viridula, Hordeum jubatum, Vicia americana, Bromus inermis, Artemisia frigida, Grindelia squarrosa, Melilotus officinalis, Rumex crispus*, and *Sonchus asper.* De Vries (1968) briefly describes a *Pascopyrum smithii* and *Elymus trachycaulus* Consociation with the former species dominating on drier soils and the latter on more moist soils. Cornish (1996) describes a similar type for WOSPP, which occupies eroded pits, and "blowouts" and forms a complex with a Wheat grass - Bluegrass type.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Grassland
SUBGROUP: Natural/Semi-natural
FORMATION: Medium-tall sod Temperate or Subpolar Grassland
ALLIANCE: *Pascopyrum smithii* Herbaceous Alliance
ASSOCIATION: ***Pascopyrum smithii*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: NatureServe CEGL001577
CLASSIFICATION CONFIDENCE LEVEL: 1 (High) Good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Pascopyrum smithii*
CO-DOMINANT SPECIES: *Stipa viridula Hordeum jubatum, Vicia americana, Bromus inermis, Artemisia frigida, Grindelia squarrosa, Melilotus officinalis, Rumex crispus, Sonchus asper*
DIAGNOSTIC SPECIES: *Pascopyrum smithii*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3S4
RANK JUSTIFICATION: Minor type according to Thompson and Hansen (2002). NatureServe (2004) ranks this type as G3G5Q globally. Relatively common type in WOSPP.
PLOT NUMBERS: 2

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

De Vries, B. 1968. A preliminary botanical investigation of Writing-On-Stone Provincial Park in Southern Alberta. The Blue Jay. Pages 41-53

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

Vujnovic, K. and J. Bentz. 2001. Preliminary classification of native wheat grass (Agropyron spp.) community types in Alberta. Prep for. Alberta Natural Heritage Information Centre, Edmonton, AB. Prep by. Geowest Environmental Consultants Ltd., Edmonton, AB

3.2.3.13 ***Pascopyrum smithii - Glycyrrhiza lepidota*** **Herbaceous Vegetation**

Western Wheat - Wild licorice Herbaceous Vegetation

DESCRIPTION:

This type represents the early to mid seral or disturbed site of the *Pascopyrum smithii* Herbaceous type (Thompson and Hansen 2002). Disturbance of the *Pascopyrum smithii* Herbaceous type typically leads to an increase in *Bromus inermis, Artemisia ludoviciana, Artemisia frigida* and *Glycyrrhiza lepidota*. This type occupies the lower area of depressional sites, level portion of alluvial fans, and lower sections of alluvial terraces receiving overland flow. These sites often have perched water tables or otherwise have soil conditions that enhance moisture supply. The one plot completed in WOSPP was moderately well drained, and had submesic moisture levels with submesotrophic nutrient regimes. This site was likely drier than typical sites which are expected to be seasonally flooded and poor to very poorly drained (Thompson and Hansen 2002). Typically *Pascopyrum smithii* cover is dominant (40-98%) followed by the *Poa pratensis* (0-40%), and *Glycyrrhiza lepidota* (0-40%). Other common species reported for this type included *Hordeum jubatum, Achillea millefolium, Artemisia ludoviciana*, and *Stipa viridula*. At the one plot completed in WOSPP plants species included *Pascopyrum smithii* (63% cover), *Glycyrrhiza lepidota* (3%), *Hordeum jubatum* (3%), and *Deschampsia caespitosum* (0.5%).

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Submesic Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Pascopyrum smithii* Herbaceous Alliance
ASSOCIATION: ***Pascopyrum smithii - Glycyrrhiza lepidota*** **Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Only one plot completed in WOSPP but appeared to fit the type described by Thompson and Hansen (2002) and occurs within the known range.

DOMINANT SPECIES: *Pascopyrum smithii, Glycyrrhiza lepidota, Poa pratensis,*
CO-DOMINANT SPECIES: *Artemisia cana, Rosa spp., Symphoricarpos occidentalis, Hordeum jubatum, Stipa viridula, Bromus inermis, Artemisia frigida, Artemisia ludoviciana*
DIAGNOSTIC SPECIES: *Pascopyrum smithii,(Glycyrrhiza lepidota)*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3?
RANK JUSTIFICATION: Thompson and Hansen (2002) indicate that the *Pascopyrum smithii* Herbaceous type is a minor riparian and wetland type. They summarised data for 20 stands of this seral stage type but further research is required. It was not common in WOSPP and appears to have fairly narrow habitat specificity, which will restrict its distribution and potentially increase vulnerability to extirpation.
PLOT NUMBERS: 88

REFERENCES:

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.2.3.14 Hesperostipa comata - Bouteloua gracilis - **Herbaceous Vegetation**
Needle-and-thread grass - Blue grama grassHerbaceous Vegetation

Cornish (1996) reported this type to be wide spread in WOSPP but does not form extensive stands and it commonly occurs as disclimax stands in the southwest portion of the Park where grazing is prevalent (Figure 10). Gerling et al. (1996) described an equivalent community type, *Hesperostipa comata–Bouteloua gracilis*, with very similar floristics. This type occurs on medium-textured glacial tills throughout the Park and on the coarse-textured moraine/glacial outwash complex in the northeast section of WOSPP. Based on Cornish (1996) and the two plots completed for this type, soils are well drained with xeric moisture levels and submesotrophic (poor) nutrient regimes. *Hesperostipa comata* tends to be the dominant species although *Bouteloua gracilis* may dominate in some stands and is a disturbance-increaser on heavily grazed lands. Other important plant species are *Pascopyrum smithii, Koeleria macrantha, Poa sandbergii, Carex stenophylla, Artemisia frigida, Selaginella densa, Sphaeralcea coccinea,* and *Heterotheca villosa.*

De Vries (1968) described a similar type for WOSPP, which he identified as a *Hesperostipa comata - Bouteloua gracilis - Pascopyrum smithii* Community. It occurs on drier soils that are loams and sandy-loams in uplands and open slopes. Dominant species included *Hesperostipa comata, Bouteloua gracilis, Pascopyrum smithii,* and lesser amounts of *Koeleria macrantha, Carex filifolia, Calamovilfa longifolia, Muhlenbergia cuspidata, Agropyron cristatum, Artemisia frigida, Antennaria parvifolia*, and *Astragalus pectinatus*. Where this type occurs on open slopes *Juniperus horizontalis* and *Artemisia cana* are common. NatureServe (2004) describes a *Hesperostipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation type that appears to be very similar to the type described by De Vries (1968). It is also similar to the *Hesperostipa comata - Bouteloua gracilis* Herbaceous Vegetation type with the exception that the one sampled on this study lacks *Carex filifolia* cover. In WOSPP, there appeared to be a continuum of community types with similar floristics and additional sampling is recommended to resolve the level of variance within types and the relationship of these types to other previously described ones.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Subxeric Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: Hesperostipa comata Herbaceous Alliance
ASSOCIATION: ***Hesperostipa comata - Bouteloua gracilis* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Moderately good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Bouteloua gracilis, Hesperostipa comata*
CO-DOMINANT SPECIES: *Pascopyrum smithii, Koeleria macrantha, Poa sandbergii, Carex stenophylla, Artemisia frigida, Selaginella densa, Sphaeralcea coccinea, Heterotheca villosa*
DIAGNOSTIC SPECIES: *Bouteloua gracilis, Hesperostipa comata*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4?
RANK JUSTIFICATION: Dominant species are relatively common in Alberta and this community type appears to be common in WOSPP. However, further research is required to define this and similar community types more precisely. NatureServe ranks the *Hesperostipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation type as G5. Allen (2003) ranks the *Pascopyrum smithii - Hesperostipa comata - Bouteloua gracilis* Type as S2S3.
PLOT NUMBERS: 39,82

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

De Vries, B. 1968. A preliminary botanical investigation of Writing-On-Stone Provincial Park in Southern Alberta. The Blue Jay. Pages 41-53

Gerling, H.S., M.G. Willoughby, A. Schoepf, K.E. Tannas and C.A. Tannas. 1996. A guide to using native plants on disturbed lands. Alberta Agriculture, Food and Rural Development and Alberta Environmental Protection. 247pp.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

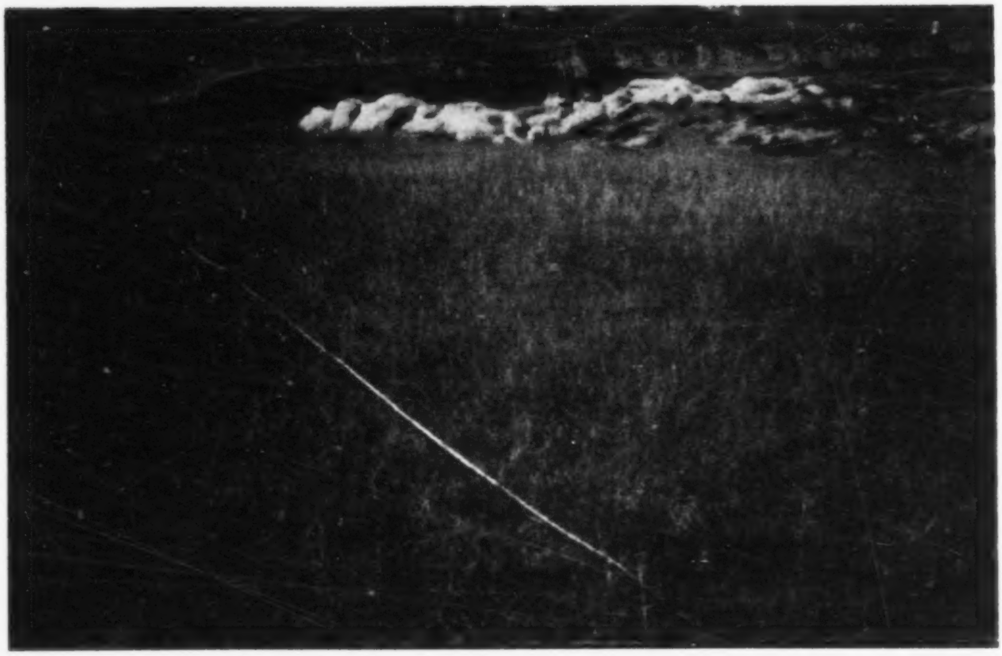

Figure 9. *Calamovilfa longifolia - Hesperostipa comata* Herbaceous Vegetation type.

Figure 10. *Hesperostipa comata - Bouteloua gracilis* Herbaceous Vegetation type.

3.2.3.15 *Hesperostipa comata - Pascopyrum smithii* - (*Poa sandbergii*) Herbaceous Vegetation

Needle-and-thread grass - Western wheat grass - (Sandberg bluegrass) Herbaceous Vegetation

This type is the equivalent to the Needle-and-thread - Wheat grass (*Hesperostipa comata - Pascopyrum smithii)* type identified by (Cornish 1996). It is considered the dominant grassland association in WOSPP (Figure 11) and occurs on Orthic Brown and Dark Brown Chernozems in the uplands and on river terraces. On the current study two stands were sampled, one facing south and the other east. In the coulees this grassland plant association typically occurs in mid slope positions on gentle inclines (20%). Soils have xeric to subxeric moisture levels and mesotrophic nutrient regimes. *Hesperostipa comata* (47-55% cover) is most abundant followed by *Pascopyrum smithii* (1-31%), *Poa sandbergii* (1-8%), and *Koeleria macrantha* (0-5%). Other plant species include *Bouteloua gracilis, Artemisia frigida, Phlox hoodii, Sphaeralcea coccinea, Tragopogon dubius*, and *Liatris punctata.*

This type is similar to the *Pascopyrum smithii - Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation (CEGL002034) listed by NatureServe (2003). It is reported from the north-central Great Plains and occurs in Manitoba and Saskatchewan but is not reported to occur in Montana. This is an upland grassland type and site conditions appear to be similar to the WOSPP type. Species composition also appears to be similar, however, *Poa sandbergii* is not listed as a diagnostic or associate species. Wheatley and Bentz (2002) report a *Hesperostipa comata - Koeleria macrantha - Pascopyrum smithii* type for the Central Parkland Subregion that is also similar in species composition. Vujnovic and Bentz (2001) describe a *Pascopyrum smithii - Hesperostipa comata - Bouteloua gracilis* type that occurs in the Milk River Natural Area and other areas of the Dry Mixedgrass and Mixedgrass subregions. These communities grade into one another and additional sampling is required to clarify the differences between community types.

CLASS: Herbaceous Vegetation

SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Submesic Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Hesperostipa comata* Herbaceous Alliance
ASSOCIATION: ***Hesperostipa comata - Pascopyrum smithii - (Poa sandbergii)* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Common type in WOSPP but additional plots are required to more firmly establish species composition and determine relationship to other similar types.

DOMINANT SPECIES: *Hesperostipa comata, Pascopyrum smithii, , Poa sandbergii*
CO-DOMINANT SPECIES: *Koeleria macrantha, Bouteloua gracilis, Artemisia frigida, Phlox hoodii, Sphaeralcea coccinea, Tragopogon dubius, Liatris punctata, Krascheninnikovia lanata, Opuntia polyacantha, Lygodesmia juncea*
DIAGNOSTIC SPECIES: *Hesperostipa comata, Pascopyrum smithii Poa sandbergii, Koeleria macrantha, Artemisia frigida*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3?
RANK JUSTIFICATION: The similar type, *Pascopyrum smithii - Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation type (CEGL002034) listed by NatureServe (2003) is listed as G4. The *Pascopyrum smithii - Hesperostipa comata - Bouteloua gracilis* type (CEAB000141) is listed provincially as S2S3 (Allen 2003). Appears to be common in WOSPP but additional sampling is required to clarify the relationship to similar published community types.
PLOT NUMBERS: 38,58

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Wheatley, M. and J. Bentz. 2002. A preliminary classification of plant communities in the Central Parkland Natural Subregion of Alberta. Prep. for Alberta Sustainable Resource Development, Resource Data Branch, Edmonton. Prep. by Geowest Environmental Consultants Ltd., Edmonton.

3.2.3.16 ***Elymus lanceolatus - Pascopyrum smithii*** **Herbaceous Vegetation**

Northern wheat grass - Western wheat grass Herbaceous Vegetation

Vujnovic and Bentz (2001) indicate that this plant association is distributed widely in Alberta with records from the Dry Mixedgrass and Dry Mixedwood Subregions. In the Dry Mixedgrass Subregion it occurs on moderately well to well drained Solonetzic soils, including Brown Solodized Solonetz and Brown Solonetz with minor occurrence of Brown Solods, Brown Chernozems and Orthic Regosols (Vujnovic and Bentz 2001, Allen 2003). In WOSPP (n=1), this type is not common but occurs on lower gentle slopes with well drained soils that have submesic moisture levels and a mesotrophic (medium) nutrient regime (Figure 12). Shrub cover was regarded as incidental at the one site sampled and dominant cover included *Elymus lanceolatus* (21%), Pascopyrum *smithii* (12%), *Poa cusickii* (9%), *Artemisia cana* (4%), *Ericameria nauseosa* (4%), and *Stipa viridula* (3%). Other minor species recorded included *Symphoricarpos occidentalis, Sphaeralcea coccinea, Hesperostipa comata, Linum rigidum, Artemisia frigida, Artemisia ludoviciana, Krascheninnikovia lanata*, and *Heterotheca villosa*.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Graminoid Temperate or Subpolar Perennial Herbaceous Vegetation
ALLIANCE: *Elymus lanceolatus* Herbaceous Alliance
ASSOCIATION: ***Elymus lanceolatus - Pascopyrum smithii*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: Alberta CEAB000146
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Moderately good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Elymus lanceolatus, Pascopyrum smithii*
CO-DOMINANT SPECIES: *Hesperostipa comata, Artemisia frigida, Bouteloua gracilis, Poa pratensis, Koeleria macrantha, Stipa viridula, Sphaeralcea coccinea, Poa cusickii, Linum rigidum, Artemisia ludoviciana, Krascheninnikovia lanata, Heterotheca villosa* (Incidental shrubs include: *Symphoricarpos occidentalis, Artemisia cana, Ericameria nauseosa*)
DIAGNOSTIC SPECIES: *Elymus lanceolatus, Pascopyrum smithii, Hesperostipa comata, Artemisia frigida, Sphaeralcea coccinea, Poa* spp.

PROPOSED PROVINCIAL CONSERVATION RANKING: S3?
RANK JUSTIFICATION: This type is not common in WOSPP and is presently ranked as S2? in Alberta (Allen 2003). Vujnovic and Bentz (2001) indicate that this plant association is distributed widely in Alberta ranging from Milk River to Peace River Region where suitable sites exist.
PLOT NUMBERS: 48

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Vujnovic, K. and J. Bentz. 2001. Preliminary classification of native wheat grass (Agropyron spp.) community types in Alberta. Prep for. Alberta Natural Heritage Information Centre, Edmonton, AB. Prep by. Geowest Environmental Consultants Ltd., Edmonton, AB

3.2.3.17 ***Elymus lanceolatus - Hesperostipa comata*** **Herbaceous Vegetation**

Northern wheat grass - Needle-and-thread grass Herbaceous Vegetation

Vujnovic and Bentz (2001) provide a review of this type indicating that in the Milk River area it occurs on gentle slopes with well drained medium textured soils that are mainly Orthic Brown Chernozems and to a lesser degree Calcareous Brown and Solonetzic Brown Chernozems. This plant association is closely related to the *Elymus lanceolatus - Pascopyrum smithii* Herbaceous Vegetation type. The one stand sampled in WOSPP occurred on a gentle lower slope above Van Cleeve Creek. Soils were well drained and dry (xeric) with a mesotrophic (medium) nutrient regime. In the study area, dominant cover included *Elymus lanceolatus* (30%), *Koeleria macrantha* (17%), *Selaginella densa* (8%), *Carex filifolia* (4%), *Hesperostipa comata* (3%), *Poa sandbergii* (3%) and *Artemisia ludoviciana* (3%). Other species recorded at this plot included *Phlox hoodii, Thermopsis rhombifolia, Liatris punctata, Comandra umbellata*, and *Muhlenbergia cuspidata*. Gerling et al. (1996) describes a *Hesperostipa comata - Elymus lanceolatus* Type that is an ungrazed climax community common to the Mixedgrass Subregion. This appears to be a similar type although mean cover of *Hesperostipa comata* is higher (30%) than *Elymus lanceolatus* (15%) and other dominants include *Bouteloua gracilis* (10%) and *Selaginella densa* (30%). Cornish (1996) described a Wheat grass - June grass type that was similar to this type and to a lesser degree the *Elymus lanceolatus - Pascopyrum smithii* type. The Wheat grass - June grass type recognises *Elymus lanceolatus, Pascopyrum smithii* and *Koeleria macrantha* as dominants.

NatureServe (2004) identifies an Elymus lanceolatus - Hesperostipa comata Herbaceous Vegetation type that occurs in Oregon and Washington States (CEGL001746; G1 Rank). While this appears to be a similar type there are a number of differences in species composition that likely warrant separation into two different association types. The community described in this report refers to a type that is not common but is widely distributed through the mixed grasslands of southern Alberta (Vujnovic and Bentz 2001).

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Graminoid Temperate or Subpolar Perennial Herbaceous Vegetation
ALLIANCE: *Elymus lanceolatus* Herbaceous Alliance
ASSOCIATION: ***Elymus lanceolatus - Hesperostipa comata*** **Herbaceous Vegetation**
UNIQUE IDENTIFIER: Alberta CEAB000147 (Also refer to Natureserve CEGL001746)
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Moderately good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Elymus lanceolatus, Hesperostipa comata, Koeleria macrantha*
CO-DOMINANT SPECIES: *Selaginella densa, Carex filifolia, Poa sandbergii, Artemisia ludoviciana, Phlox hoodii, Thermopsis rhombifolia, Liatris punctata, Comandra umbellata*, and *Muhlenbergia cuspidata*.
DIAGNOSTIC SPECIES: *Elymus lanceolatus, Hesperostipa comata, Koeleria macrantha, Selaginella densa*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: While not common this type appears to be widely distributed through the Mixed Grasslands (Vujnovic and Bentz 2001). Allen (2003) ranked this type as S1S2 in Alberta.
PLOT NUMBERS: 65

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

Gerling, H.S., M.G. Willoughby, A. Schoepf, K.E. Tannas and C.A. Tannas. 1996. A guide to using native plants on disturbed lands. Alberta Agriculture, Food and Rural Development and Alberta Environmental Protection. 247pp.

Vujnovic, K. and J. Bentz. 2001. Preliminary classification of native wheat grass (Agropyron spp.) community types in Alberta. Prep for. Alberta Natural Heritage Information Centre, Edmonton, AB. Prep by. Geowest Environmental Consultants Ltd., Edmonton, AB.

3.2.3.18 Elymus trachycaulus Herbaceous Vegetation

Slender Wheat grass Herbaceous Vegetation

Vujnovic and Bentz (2001) indicate that this plant association is distributed widely throughout the province. In the Suffield area it occurs on well drained to imperfectly drained Orthic Regosols and Orthic Eutric Brunisols with sandy loam to silt loam textures (Adams et al. 1997). This is minor type in WOSPP and only one releve was completed in the Van Cleeve riparian zone. It occurs as a distinct homogenous plant association and the one patch sampled occurred adjacent to the *X Agrohordeum* Herbaceous Type. Soils are moderately well drained with mesic moisture levels, and mesotrophic (medium) nutrient regimes. There is no shrub layer and the herbaceous layer is a homogenous cover (50-75%) of *Elymus trachycaulus*. Plant species recorded adjacent to this type included *Glycyrrhiza lepidota, Hordeum jubatum* and *X Agrohordeum*.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Graminoid Temperate or Subpolar Perennial Herbaceous Vegetation
ALLIANCE: *Elymus trachycaulus* Herbaceous Alliance
ASSOCIATION: ***Elymus trachycaulus*** **Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Limited plot data but good correlation of plot data with the published literature for the type and occurs within the known geographical range.

DOMINANT SPECIES: *Elymus trachycaulus*
CO-DOMINANT SPECIES: None. (*Glycyrrhiza lepidota, Hordeum jubatum* and *X Agrohordeum* were recorded outside of plot.)
DIAGNOSTIC SPECIES: *Elymus trachycaulus*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4?
RANK JUSTIFICATION: Although *Elymus trachycaulus* is relatively common in WOSPP monoculture stands are not as common. ANHIC (2002) ranked *Elymus trachycaulus* as S5 in Alberta. Vujnovic and Bentz (2001) indicate that this plant association is distributed widely throughout the province including grassland, montane, foothills and boreal regions. However, additional research on species composition and site conditions for the type is required.
PLOT NUMBERS: 71

REFERENCES:

Adams, G.D., G.C. Trottier, W.L. Strong, I.D. MacDonald, S.J. Barry, P.G Gregoire, G.W. Babish and G.Weiss. 1997. Vegetation component report. Canadian Forces Base Suffield National Wildlife Area Wildlife Inventory. Canadian Wildlife Service, Environment Canada, Edmonton, Alberta.

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

Vujnovic, K. and J. Bentz. 2001. Preliminary classification of native wheat grass (Agropyron spp.) community types in Alberta. Prep for. Alberta Natural Heritage Information Centre, Edmonton, AB. Prep by. Geowest Environmental Consultants Ltd., Edmonton, AB.

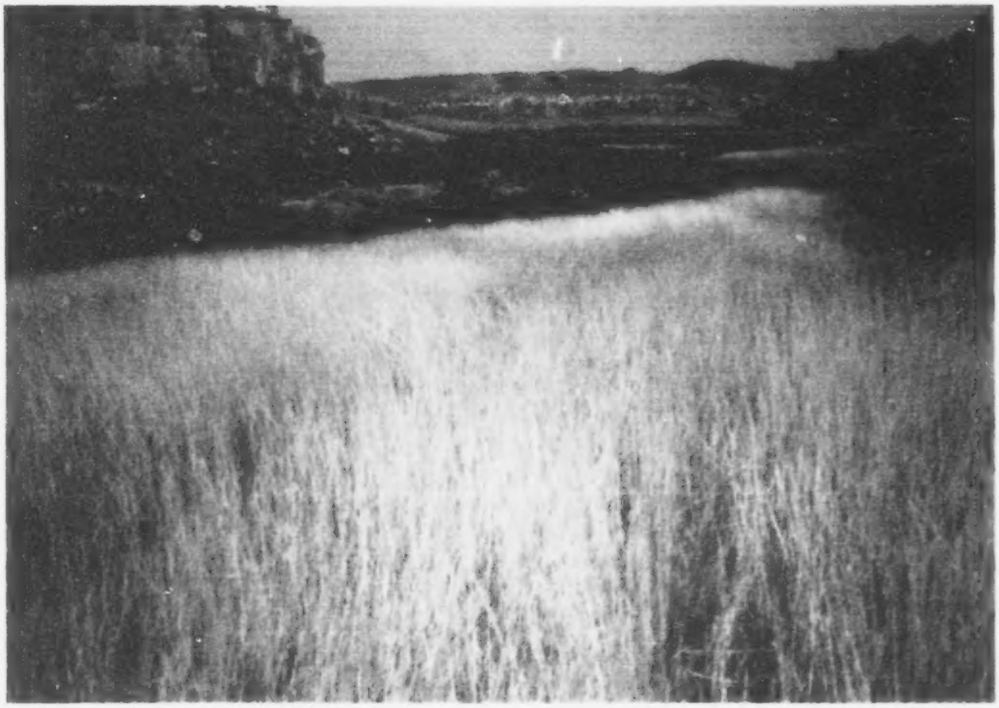

Figure 11. *Hesperostipa comata - Pascopyrum smithii – Koeleria macrantha* Herbaceous Vegetation type.

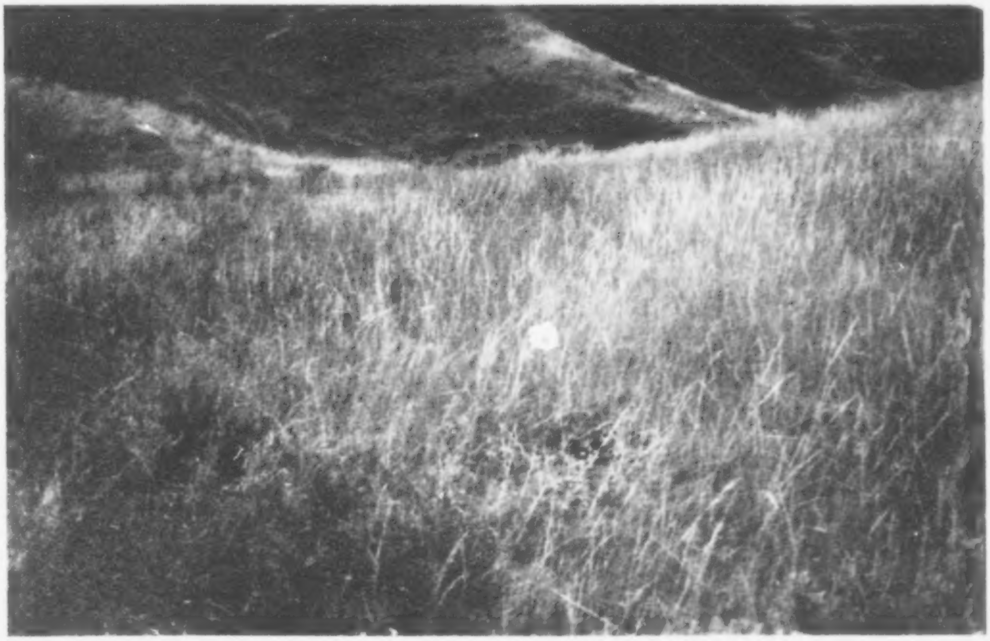

Figure 12. *Elymus lanceolatus – Pascopyrum smithii* Herbaceous Vegetation type.

3.3 TENTATIVE CLASSIFICATIONS

3.3.1 WOODLAND

3.3.1.1 ***Populus x acuminata / Symphoricarpos occidentalis*** **Woodland**
Lance-leaved Cottonwood / Buck brush Woodland

DESCRIPTION:
This plant association occurs as small isolated stands in the Park and based on other cottonwood stands is likely minor to incidental type in riparian zones in the Mixedgrass Natural Subregion (Figure 13). It occurs in Davis Coulee where one stand was sampled. Other stands are known to occur in Police Coulee (Wershler 1980). Periodic flooding may be expected at these sites and recently deposited alluvium and full sunlight is required for stand establishment. Soil moisture levels are mesic and nutrient regimes are mesotrophic (medium). *Populus x acuminata* is the dominant tree, and the shrub and herbaceous layers are diverse and dense. Common shrubs include *Symphoricarpos occidentalis, Amelanchier alnifolia, Prunus virginiana, Cornus sericea*, and *Juniperus communis.* In the one stand sampled dominant herbaceous plants included *Bromus inermis, Poa pratensis*, and *Stipa viridula.* The herb layer also includes lesser amounts of *Elymus piperi, Smilacina stellata, Aster laevis, Monarda fistulosa, Thalictrum venulosum, Achillea millefolium* and *Solidago missouriensis.*

CLASS: Woodland
SUBCLASS: Deciduous Woodland
GROUP: Temperate or Subpolar Cold-deciduous Woodland
SUBGROUP: Natural/Semi-natural
FORMATION: Intermittently Flooded Temperate or Subpolar Cold-deciduous Woodland
ALLIANCE: *Populus x acuminata* Woodland Alliance
ASSOCIATION: ***Populus x acuminata / Symphoricarpos occidentalis*** **Woodland**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Limited plot data and no published literature was reviewed for the type. Occurs within the known geographical range of the indicator species but range of the community type not determined.

DOMINANT SPECIES: *Populus x acuminata, Symphoricarpos occidentalis, Bromus inermis, Poa pratensis*
CO-DOMINANT SPECIES: *Amelanchier alnifolia, Prunus virginiana, Rosa spp., Cornus sericea, Juniperus communis, Stipa viridula Elymus piperi, Smilacina stellata, Aster laevis, Monarda fistulosa, Thalictrum venulosum, Achillea millefolium, Solidago missouriensis*
DIAGNOSTIC SPECIES: *Populus x acuminata, Symphoricarpos occidentalis, Bromus inermis, Poa pratensis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2?
RANK JUSTIFICATION: *Populus x acuminata* is restricted to episodic flood sites in riparian zones and stands are vulnerable to changes in site conditions due to over grazing and alteration of stream flow dynamics. This type was not common in WOSPP. Allen (2003) ranks most other cottonwood types as S2/S3.
PLOT NUMBERS: 85

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.
Wershler, C.R. 1980. South Writing-on-Stone Natural History Inventory.

3.3.2 SHRUBLAND

3.3.2.1 Sarcobatus vermiculatus - Atriplex nuttallii / Distichlis spicata **Dwarf-shrubland**
Greasewood - Nuttall's atriplex / Salt grass Dwarf-shrubland

In WOSPP, this plant association (Figure 14) occurs on variable aspects of steep coulee slopes (60–80%). It also occurs on more gentle slopes where site conditions are favourable. Slumping and solifluction is evident on most sites and surface substrates typically have over 75% mineral soil, stone and cobble. Soils are poorly developed and the presence of greasewood and salt grass indicate saline conditions. Sites are well drained and very xeric with oligotrophic nutrient regimes. This type most often occurs in horizontal bands of vegetation coinciding with the orientation of slumps. Vegetation is usually sparse with less than 40% total cover although patches of S*arcobatus vermiculatus* may form dense canopy closures of up to 55%. Associated plant species include *Atriplex nuttallii, Distichlis spicata, Elymus lanceolatus, Ericameria nauseosa,* and *Gutierrezia sarothrae.* Cornish (1996) provided a preliminary description of this type and identified it as a Greasewood - Silver sagebrush / forbs / Wheat grass type.

Thompson and Hansen (2002) and Allen (2003) describe a similar type, *Sarcobatus vermiculatus - Pascopyrum smithii,* which is considered incidental in southeastern Alberta. It occupies near level dry portions of riparian zones on older alluvial terraces in floodplains, and alluvial fans. Co-dominant species in this type include *Bromus japonicus, Poa pratensis, Distichlis spicata, Poa juncifolia, Descurainia pinnata, Hordeum jubatum, Puccinellia nuttalliana,* and *Suaeda calceoliformis.* NatureServe (2004) lists a *Sarcobatus vermiculatus / Distichlis spicata* Shrubland type (CEGL001363) that appears to be similar to the currently described type. However, it does not list *Atriplex nuttallii* as a dominant, which is one of the diagnostic species of the WOSPP type.

CLASS: Dwarf-shrubland
SUBCLASS: Evergreen Dwarf-shrubland
GROUP: Temperate or Subpolar Succulent-leaved Evergreen Dwarf-shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Xeric Alkali-tolerant Temperate or Subpolar Succulent-leaved Evergreen Dwarf-shrubland
ALLIANCE: *Sarcobatus vermiculatus* Dwarf-shrubland Alliance
ASSOCIATION: ***Sarcobatus vermiculatus - Atriplex nuttallii / Distichlis spicata*** **Dwarf-shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Relatively good constancy of plant species and site conditions but limited plot data (n=4) and no account of this specific type was located in the published literature. Geographical range is not known.

DOMINANT SPECIES: *Sarcobatus vermiculatus, Atriplex nuttallii, Distichlis spicata,*
CO-DOMINANT SPECIES: *Elymus lanceolatus, Festuca saximontana, Hordeum jubatum, Ericameria nauseosa, Gutierrezia sarothrae, Pascopyrum smithii, Koeleria macrantha, Krascheninnikovia lanata, Phlox hoodii*
DIAGNOSTIC SPECIES: *Sarcobatus vermiculatus, Atriplex nuttallii, Distichlis spicata*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: Common type in WOSPP but incidence outside of the Park and distribution are not well defined. NatureServe (2004) ranks the *Sarcobatus vermiculatus / Distichlis spicata* Shrubland type (CEGL001363) as G4.
PLOT NUMBERS: 11,14,17,21,27

REFERENCES:
Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Cornish, B. 1996. Biophysical and range inventory at Writing-on-Stone Provincial Park. Prep. for Resource Data Division, Alberta Environmental Protection, Edmonton, Alberta. 38pp

Thompson, W.H. and P.L. Hansen. 2002. Classification and management of riparian and wetland sites of the Alberta Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prep. For the Alberta Riparian Habitat Management Program-Cows and Fish, Lethbridge, Alberta.

3.3.2.2 ***Ericameria nauseosa - Gutierrezia sarothrae / Koeleria macrantha* Dwarf-shrubland**

Rabbitbrush - Broomweed / June grass Dwarf-shrubland

This type is associated with badland habitat and coulee slopes. Preliminary sampling (n=1) indicates soils are rapidly drained, xeric and have submesotrophic nutrient regimes. Surface substrates have high mineral soil cover (50%). *Ericameria nauseosa (= Chrysothamnus nauseosus), Gutierrezia sarothrae,* and *Koeleria macrantha* account for the majority of vegetation ground cover. Other common plant species include *Pascopyrum smithii, Phlox hoodii, Distichlis spicata, Atriplex nuttallii, Krascheninnikovia lanata, Symphoricarpos occidentalis,* and *Artemisia frigida.*

CLASS: Dwarf-shrubland
SUBCLASS: Deciduous Dwarf-shrubland
GROUP: Temperate or Subpolar Cold-Deciduous Dwarf-shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Subxeric Temperate or Subpolar Cold-Deciduous Open Dwarf-shrubland
ALLIANCE: *Ericameria nauseosa* Dwarf-shrubland Alliance
ASSOCIATION: ***Ericameria nauseosa - Gutierrezia sarothrae / Koeleria macrantha* Dwarf-shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Only one plot completed but the *Ericameria nauseosa* and *Gutierrezia sarothrae* association appeared to be a relatively common type that was associated with badland habitat and steep slopes. There was no reference to this type in the literature reviewed and the geographical distribution is not known.

DOMINANT SPECIES: *Ericameria nauseosa, Gutierrezia sarothrae, Koeleria macrantha*
CO-DOMINANT SPECIES: *Pascopyrum smithii, Phlox hoodii, Distichlis spicata, Atriplex nuttallii, Krascheninnikovia lanata, Symphoricarpos occidentalis and Artemisia frigida*
DIAGNOSTIC SPECIES: *Ericameria nauseosa, Gutierrezia sarothrae, Koeleria macrantha, Atriplex nuttallii,*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: This type is restricted to the Dry Mixedgrass Natural Subregion on dry slopes and badland habitats. *Ericameria nauseosa* is restricted to the Dry Mixedgrass Natural Subregion and *Gutierrezia sarothrae* is distributed throughout the Grassland and Parkland Natural Regions (Moss 1983). ANHIC (2002) ranks *Gutierrezia sarothrae* as S4 and *Ericameria nauseosa* as S3. No similar types are listed by NatureServe (2004).
PLOT NUMBERS: 89

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

Moss, E. H. 1983. Flora of Alberta. 2nd edition. (Revised by J. Packer) University of Toronto Press, Toronto Ontario. 687pp.

NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Figure 13. *Populus x acuminata / Symphoricarpos occidentalis* Woodland type.

Figure 14. *Sarcobatus vermiculatus - Atriplex nuttallii / Distichlis stricta* Dwarf-shrubland type.

3.3.2.3 ***Toxicodendron radicans* Shrubland**
Poison Ivy Shrubland

DESCRIPTION:
This plant association (Figure 15) is locally common in WOSPP where it occurs within thickets and at the base of cliffs and other favourable sites with sandy soils (Wershler 1980). Based on the one site sampled soils are well drained, with submesic moisture levels and mesotrophic (medium) nutrient regimes. *Toxicodendron radicans* (= *Rhus radicans*) forms a closed canopy cover (85%) but is often associated with other shrubs such as *Amelanchier alnifolia, Symphoricarpos occidentalis* and *Ribes aureum.* Herbaceous vegetation at the one site sampled was limited to *Elymus trachycaulus (15%)* and *Poa pratensis* (15%).

CLASS: Dwarf-shrubland
SUBCLASS: Evergreen Dwarf-shrubland
GROUP: Temperate or Subpolar Broad-leaved Evergreen Dwarf-shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Submesic Sandy-soil Temperate or Subpolar Broad-leaved Evergreen Dwarf-shrubland
ALLIANCE: *Toxicodendron radicans* Dwarf-shrubland Alliance
ASSOCIATION: ***Toxicodendron radicans* Dwarf-shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) High canopy closure of *Toxicodendron radicans* forms recognisable and distinct community type. There was no reference found in the literature to similar community types within the local geographical area and the range of this type is uncertain.

DOMINANT SPECIES: *Toxicodendron radicans*
CO-DOMINANT SPECIES: *Amelanchier alnifolia, Symphoricarpos occidentalis, Ribes aureum, Elymus trachycaulus, Poa pratensis*
DIAGNOSTIC SPECIES: *Toxicodendron radicans*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: *Toxicodendron radicans* is a locally common species associated with sandy soils at the base of cliffs and in thickets (Wershler 1980) and is distributed throughout the Grassland and Parkland Natural Regions (Moss 1983). This species is ranked as S3 by ANHIC (2002). There are no similar associations listed for this region by NatureServe (2003).
PLOT NUMBERS: 87

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

Moss, E. H. 1983. Flora of Alberta. 2nd edition. (Revised by J. Packer) University of Toronto Press, Toronto Ontario. 687pp.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Wershler, C.R. 1980. South Writing-on-Stone Natural History Inventory.

3.3.2.4 ***Rhus trilobata - Artemisia cana / Hesperostipa comata* Shrubland**
Skunkbush - Silver sagebrush - Needle-and-thread grass Shrubland

This type is common throughout the Park on warm southerly facing slopes, in badlands and hoodoos habitat, and on a variety of other sites including floodplains (Figure 16). Slope gradients vary (20–80%) but most sites have moderately high substrate cover of mineral soil, stone and cobble. Soils are rapid to well drained, with very xeric to subxeric moisture conditions and submesotrophic (poor) to mesotrophic (medium) nutrient regimes. *Rhus trilobata* and *Artemisia cana* are the most prominent plants of this community. *Hesperostipa comata* cover is common and other herbaceous species include *Carex filifolia, Pascopyrum smithii, Elymus lanceolatus, Opuntia polyacantha, Phlox hoodii, Stipa viridula, Koeleria macrantha, Artemisia ludoviciana,* and *Artemisia frigida.*

CLASS: Dwarf-shrubland
SUBCLASS: Evergreen Dwarf-shrubland
GROUP: Temperate or Subpolar Broad-leaved Evergreen Dwarf-shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Xeric Temperate or Subpolar Broad-leaved Evergreen Open Dwarf-shrubland
ALLIANCE: *Rhus trilobata* Shrubland Alliance
ASSOCIATION: ***Rhus trilobata - Artemisia cana / Hesperostipa comata* Shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Common type but limited plot data (n=3) and no published literature was reviewed for the type. Occurs within the known geographical range of the indicator species but range of the community type not determined.

DOMINANT SPECIES: *Rhus trilobata, Artemisia cana, Hesperostipa comata*
CO-DOMINANT SPECIES: *Carex filifolia, Pascopyrum smithii, Elymus lanceolatus, Opuntia polyacantha, Phlox hoodii, Stipa viridula, Koeleria macrantha, Artemisia ludoviciana,Artemisia frigida.*
DIAGNOSTIC SPECIES: *Rhus trilobata, Artemisia cana, Hesperostipa comata*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: Distribution of *Rhus trilobata* is restricted primarily to the Grassland Natural Region (Moss 1983) and this species is ranked as S3 by ANHIC (2002). NatureServe (2003) ranks *Rhus trilobata / Calamovilfa longifolia Shrub* Herbaceous Vegetation *as* G3Q and *Rhus trilobata / Carex filifolia Shrub* Herbaceous Vegetation as G3.
PLOT NUMBERS: 29,35,54

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

Moss, E. H. 1983. Flora of Alberta. 2nd edition. (Revised by J. Packer) University of Toronto Press, Toronto Ontario. 687pp.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Figure 15. *Rhus radicans* Shrubland type occurs on sandy soils.

Figure 16. *Rhus trilobata - Artemisia cana / Hesperostipa comata* Shrubland type.

3.3.2.5 Symphoricarpos occidentalis / Elymus piperi Shrubland
Buckbrush / Giant Wild Rye Shrubland

This riparian plant community occurs as distinct patches where there is adequate moisture and good soil nutrient conditions (Figure 17). Although *Elymus piperi* with its height is the most prominent feature of this community there typically is a high percent cover of *Symphoricarpos occidentalis*, which actually forms the understory. Sites are level or depressional and are characteristically subjected to occasional flooding. Soils are moderately well drained with submesic to mesic moisture conditions and mesotrophic (medium) nutrient regime. The dense cover of *Symphoricarpos occidentalis* and *Elymus piperi* tend to restrict the growth of other plant species. However, other minor species include *Poa pratensis, Mentha arvense, Thalictrum venulosum, Cirsium arvense, Urtica dioica, Rosa woodsii,* and *Smilacina stellata.*

CLASS: Shrubland
SUBCLASS: Deciduous Shrubland
GROUP: Temperate or Subpolar Broad-leaved Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Mesic Temperate or Subpolar Broad-leaved Cold-deciduous Shrubland
ALLIANCE: *Symphoricarpos occidentalis* Shrubland Alliance
ASSOCIATION: ***Symphoricarpos occidentalis / Elymus piperi* Shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) This community type was quite distinctive with good constancy of the lead species. No other reference to this type was reviewed and the geographical range is not known.

DOMINANT SPECIES: *Symphoricarpos occidentalis, Elymus piperi, Poa pratensis, Cirsium arvense*
CO-DOMINANT SPECIES: *Poa pratensis, Mentha arvense, Thalictrum venulosum, Cirsium arvense, Urtica dioica, Rosa woodsii, Smilacina stellata*
DIAGNOSTIC SPECIES: *Symphoricarpos occidentalis, Elymus piperi, Rosa woodsii, Cirsium arvense, Poa pratensis*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2S3
RANK JUSTIFICATION: Occurs in small patches and is restricted to riparian zones and other lowland sites with good moisture availability. While *Symphoricarpos occidentalis* is distributed throughout most of the province *Elymus piperi* is restricted to mainly the southwestern portion of the province (Moss 1983). ANHIC (2002) ranks *Elymus piperi* as S3 in the province.
PLOT NUMBERS: 7,15,16

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

Moss, E. H. 1983. Flora of Alberta. 2nd edition. (Revised by J. Packer) University of Toronto Press, Toronto Ontario. 687pp.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

3.3.2.6 ***Juniperus communis - Artemisia cana*** **Shrubland**
Common juniper - silver sagebrush Shrubland

This type is common and occurs throughout WOSPP on mid to steep (60-80%) upper slopes that are predominately on north to north-easterly aspects (Figure 18). Sites are generally rapidly drained with subxeric to submesic moisture levels and submesotrophic (poor) nutrient regimes. Surface substrates have high cover of mineral soil, stones, and cobble (40-85%), and frequently decaying wood cover (0-20%). *Juniperus communis* cover ranges between 25-50% and *Artemisia cana* cover between 0-20%. A variety of other species occur at low cover including *Juniperus horizontalis, Rhus trilobata, Amelanchier alnifolia, Thermopsis rhombifolia, Koeleria macrantha, Anemone multifida, Achillea millefolium, Phlox hoodii, Elymus lanceolatus, Carex filifolia, Galium boreale,* and *Calamovilfa longifolia.*

CLASS: Shrubland
SUBCLASS: Mixed Evergreen and Deciduous Shrubland
GROUP: Temperate or Subpolar Needle-leaved Evergreen and Broad-leaved Cold-deciduous Shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Subxeric Temperate or Subpolar Needle-leaved Evergreen and Broad-leaved Cold-deciduous Shrubland
ALLIANCE: *Juniperus communis S*hrubland Alliance
ASSOCIATION: ***Juniperus communis - Artemisia cana*** **Shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Common plant association in WOSPP (n=4) but no reference in the published literature was reviewed for the type. There is considerable species variability in herbaceous layer and additional sampling of stands is required to better describe the type. Extent of the range of this type is uncertain.

DOMINANT SPECIES: *Juniperus communis, Artemisia cana*
CO-DOMINANT SPECIES: *Juniperus horizontalis, Rhus trilobata, Amelanchier alnifolia, Thermopsis rhombifolia, Koeleria macrantha, Anemone multifida, Achillea millefolium, Phlox hoodii, Elymus lanceolatus, Carex filifolia, Galium boreale,* and *Calamovilfa longifolia.*
DIAGNOSTIC SPECIES: *Juniperus communis, Artemisia cana, Rhus trilobata, Amelanchier alnifolia, Thermopsis rhombifolia, Koeleria macrantha, Anemone multifida, Achillea millefolium*

PROPOSED PROVINCIAL CONSERVATION RANKING: S4
RANK JUSTIFICATION: This type appears to be relatively common in the WOSPP area and both *Juniperus communis* and *Artemisia cana* are common species distributed widely in Alberta (Moss 1983).
PLOT NUMBERS: 4,28,31,44

REFERENCES:

Moss, E. H. 1983. Flora of Alberta. 2nd edition. (Revised by J. Packer) University of Toronto Press, Toronto Ontario. 687pp.

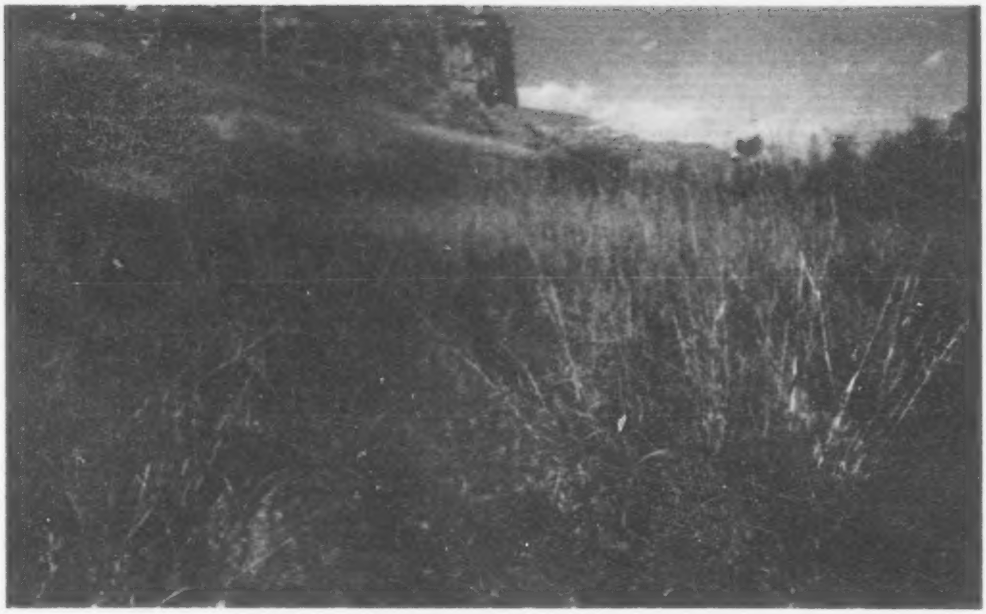

Figure 17. *Symphoricarpos occidentalis / Elymus piperi* Shrubland type.

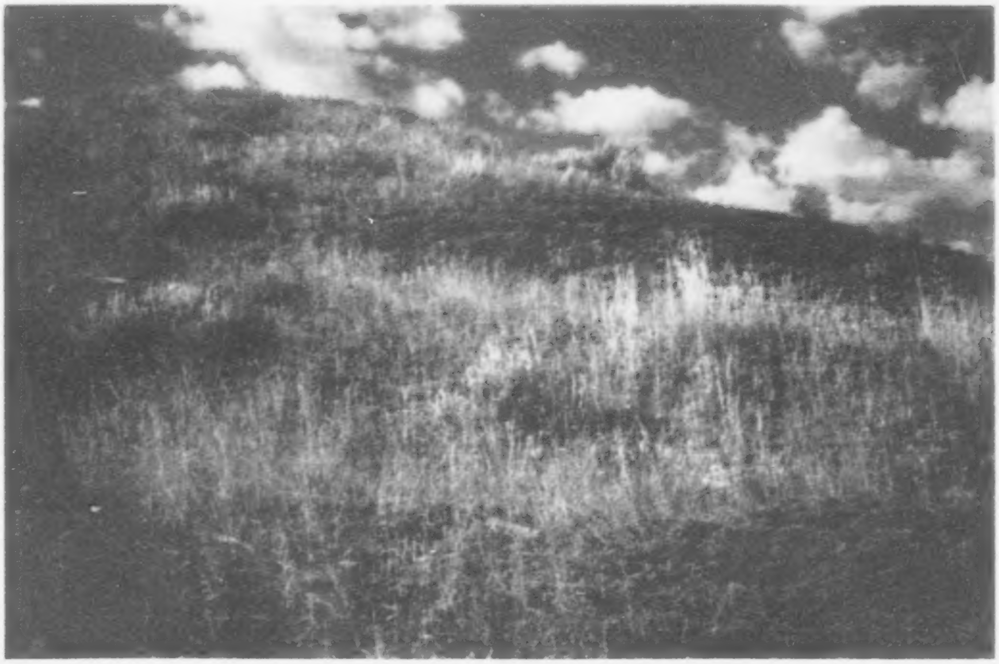

Figure 18. *Juniperus communis - Artemisia cana* Shrubland type.

3.3.2.7 Juniperus horizontalis - (Festuca scabrella) **Dwarf-shrubland**
Creeping Juniper Dwarf-shrubland

This plant association is relatively common in WOSPP on coulee slopes and is often found in association with the *Juniperus communis - Artemisia cana* type (Figure 19). At the one site sampled soils were well drained and subxeric with a submesotrophic (poor) nutrient regime. Surface substrate was mostly mineral soil (60%). *Juniperus horizontalis* clearly dominates the shrub cover (76 %) followed by *Symphoricarpos occidentalis* (15%). Both *Festuca scabrella* and *Hedysarum boreale* occured at 15% cover followed by minor cover of *Carex stenophylla, Calamovilfa longifolia, Elymus lanceolatus,* and *Thermopsis rhombifolia.*

Nature Serve (2004) lists two types that potentially occur in Alberta including *Juniperus horizontalis / Carex inops ssp. heliophila* Dwarf-shrubland (CEGL001393) and *Juniperus horizontalis / Schizachyrium scoparium* Dwarf-shrubland (CEGL001394). There are similarities in species composition between both of these stands and the WOSPP type but neither appears to be a good fit. Wheatley and Bentz (2002) identify two provincial Parkland types including *Juniperus horizontalis - Selaginella densa - Calamovilfa longifolia* and a *Juniperus horizontalis* type. Again both of these types appear to have commonality in floristics with the WOSPP type but do not appear to be the same type. A third type they refer to is the *Juniperus horizontalis / Koeleria macrantha - Artemisia frigida - Selaginella densa* community which is described by Thorpe and Goodwin (1993) for the Manito Sand Hills of Saskatchewan. This type may be more similar to the WOSPP type because it lists *Festuca hallii* as a common associate species. Allen (2003) identifies two other similar types including *Festuca hallii - Koleria macrantha / Juniperus horizontalis/* forbs Herbaceous type (CEAB000035) and *Juniperus horizontalis / Koleria macrantha - Erigeron flavum* Sparsely Vegetated type (CEAB000007). Cover of *Juniperus horizontalis* is much higher in the WOSPP type than the first type and it differs from the latter type in having more herbaceous cover and less bare ground.

CLASS: Dwarf-Shrubland
SUBCLASS: Evergreen Dwarf-shrubland
GROUP: Temperate or Subpolar Needle-leaved Evergreen Dwarf-shrubland
SUBGROUP: Natural/Semi-natural
FORMATION: Subxeric Temperate or Subpolar Needle-leaved Evergreen Dwarf-shrubland
ALLIANCE: *Juniperus horizontalis* Dwarf-shrubland Alliance
ASSOCIATION: ***Juniperus horizontalis - (Festuca scabrella)* Dwarf-shrubland**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Common plant association in WOSPP but only one stand sampled and no reference in the published literature was reviewed for the type. Additional sampling of stands is required to describe it and determine range extent.

DOMINANT SPECIES: *Juniperus horizontalis, Symphoricarpos occidentalis, Festuca scabrella, Hedysarum boreale*
CO-DOMINANT SPECIES: *Carex stenophylla, Calamovilfa longifolia, Elymus lanceolatus, Thermopsis rhombifolia*
DIAGNOSTIC SPECIES: *Juniperus horizontalis, Festuca scabrella*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: *Juniperus horizontalis* is common and widespread in WOSPP (Wershler 1980) and throughout most of Alberta's grasslands (Moss 1983). *Festuca scabrella* is considered rare on north-facing slopes in WOSPP (Wershler 1980).
PLOT NUMBERS: 53

REFERENCES:

Moss, E. H. 1983. Flora of Alberta. 2nd edition. (Revised by J. Packer) University of Toronto Press, Toronto Ontario. 687pp.

Thorpe, J. and R. Godwin. 1993. Vegetation Survey of the Manito Sand Hills. Applied Plant Ecology Section, Saskatchewan Research Council, Publication No. E2550-1-E-93.

Wershler, C.R. 1980. South Writing-on-Stone Natural History Inventory.

Wheatley, M. and J. Bentz. 2002. A preliminary classification of plant communities in the Central Parkland Natural Subregion of Alberta. Prep. for Alberta Sustainable Resource Development, Resource Data Branch, Edmonton. Prep. by Geowest Environmental Consultants Ltd., Edmonton.

3.3.3 HERBACEOUS VEGETATION

3.3.3.1 ***Festuca scabrella*** **Herbaceous Vegetation**

Rough fescue Herbaceous Vegetation

Wershler (1980) considered *Festuca scabrella* to be rare in WOSPP. *Festuca scabrella* has been separated into *F. hallii* and *F. campestris*, however, the species of *Festuca* present in the WOSPP plots was not determined. *Festuca hallii* is characteristic of the prairies but *Festuca campestris* may be present based on the proximity to the Sweet Grass Hills in Montana and the foothills to the west. On the current study several patches of *Festuca scabrella* were encountered in the southern portion of the Park where it forms robust patches of 100m^2 or more (Figure 20). This type is most common on steep (50-60%) mid to upper slope positions on cool north-facing aspects. Substrates are predominately organic with 15-30% mineral soil coverage. Soils are typically well drained with submesic moisture levels, and mesotrophic (medium) nutrient regimes. *Festuca scabrella* forms the dominant cover (30-67%) and associate shrub species include *Juniperus horizontalis, Juniperus communis,* and *Symphoricarpos occidentalis*. Other minor grasses in this type included *Koeleria macrantha, Elymus trachycaulus, Calamovilfa longifolia*, and *Elymus lanceolatus*. Common forbs include *Galium boreale, Achillea millefolium, Thermopsis rhombifolia, Lithospermum ruderale,* and *Vicia americana.*

Adams et al. (2003) describes a similar type for the Foothills Natural Region that occurs on well-drained medium textured black loamy soils. They found that heavily grazing sites had reduced *Festuca campestris* cover and increased *Festuca idahoensis* and forbs such as *Artemisia frigida, Lupinus argenteus,* and *Thermopsis rhombifolia.* Resting rangeland and rotational grazing reverted lands to rough fescue dominated grasslands within 5 to 10 years. On the current study Plot #10 was similar to the Parkland and Northern Fescue Grassland type, *Festuca hallii - Koeleria macrantha / Juniperus horizontalis* / forbs Herbaceous association (CEAB000035), included on the provincial tracking list (Allen 2003). However, no *Koeleria macrantha* was recorded at this site and additional sampling is required to confirm the relationship to the WOSPP community. The other two plots supported *Koeleria macrantha* either within or adjacent to the plot but did not have *Juniperus horizontalis* cover. Holcroft - Weerstra (2003) reviewed *Festuca hallii* community types occurring in the Central Parkland Natural Subregion. Potentially similar community types include *Festuca hallii*, *Festuca hallii - Calamovilfa longifolia*, and *Symphoricarpos occidentalis - Festuca hallii.* However, no plot data was available for this review and the relationship of these to the WOSPP type is uncertain.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Submesic Temperate or Subpolar Perennial Short Graminoid Herbaceous Vegetation
ALLIANCE: *Festuca scabrella* Herbaceous Alliance
ASSOCIATION: ***Festuca scabrella* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) *Festuca scabrella* is clearly the dominant plant species but additional sampling is required to identify the species and define the community type(s) more accurately.

DOMINANT SPECIES: *Festuca scabrella*
CO-DOMINANT SPECIES: *Juniperus horizontalis, Juniperus communis, Symphoricarpos occidentalis, Koeleria macrantha, Elymus trachycaulus, Calamovilfa longifolia, Elymus lanceolatus, Galium boreale, Achillea millefolium, Thermopsis rhombifolia, Artemisia ludoviciana, Lithospermum ruderale, Vicia americana*
DIAGNOSTIC SPECIES: *Festuca scabrella, Thermopsis rhombifolia, Artemisia ludoviciana*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: Allen (2003) ranks the F*estuca hallii - Koeleria macrantha / Juniperus horizontalis* / forbs Herbaceous association (CEAB000035) as S2 provincially. NatureServe (2003) ranks the *Festuca campestris* Herbaceous Vegetation (CEGL001627) as G3Q globally. More information is required on the species of *Festuca* present in WOSPP and additional plot replicates are required to better define the community type(s).
PLOT NUMBERS: 8,10,20

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

Holcroft - Weerstra, A.C. 2003. Plains Rough Fescue (*Festuca hallii*) Grassland Mapping – Central Parkland Natural Subregion of Alberta. Prep. for Resource Data Branch, Alberta Sustainable Resource Development, Edmonton, AB. Prep. by Biota Consultants, Cochrane, Alberta.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

Wershler, C.R. 1980. South Writing-on-Stone Natural History Inventory.

3.3.3.2 Alopecurus aequalis - Glycyrrhiza lepidota - Helianthus nuttallii Herbaceous Vegetation
Short-awned foxtail - Wild licorice - Common tall sunflower Herbaceous Vegetation

DESCRIPTION:

This is a minor type in WOSPP and only one releve was completed in the Van Cleeve riparian zone. This community was one in a series of bands of distinct plant associations adjacent to the stream and it bordered the *X Agrohordeum* Herbaceous type. Soils are moderately well drained with mesic moisture levels, and mesotrophic (medium) nutrient regimes. This plant association type occurs as discrete patches of relatively homogenous vegetation. No shrubs are present and *Alopecurus aequalis* makes up over half of the ground cover. *Glycyrrhiza lepidota, Helianthus nuttallii* and *Sonchus arvensis* are present in equal proportions (15%).

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Mesic Temperate or Subpolar Perennial Herbaceous Vegetation
ALLIANCE: *Alopecurus aequalis* Herbaceous Alliance
ASSOCIATION: ***Alopecurus aequalis - Glycyrrhiza lepidota - Helianthus nuttallii* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Limited plot data and no published literature was reviewed for the type. Occurs within the known geographical range of the indicator species but range of the community type not determined.

DOMINANT SPECIES: *Alopecurus aequalis*
CO-DOMINANT SPECIES: *Glycyrrhiza lepidota, Helianthus nuttallii, Sonchus arvensis*
DIAGNOSTIC SPECIES: *Alopecurus aequalis*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: No *Alopecurus aequalis* type is listed for Canada or the adjacent the American states (NatureServe 2003). *Alopecurus aequalis* is rated as S5 in the province (ANHIC 2002). This type is not common in WOSPP and additional research is required to define the community better and determine provincial range.
PLOT NUMBERS: 69

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list. Alberta Community Development, Edmonton, Alberta.

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

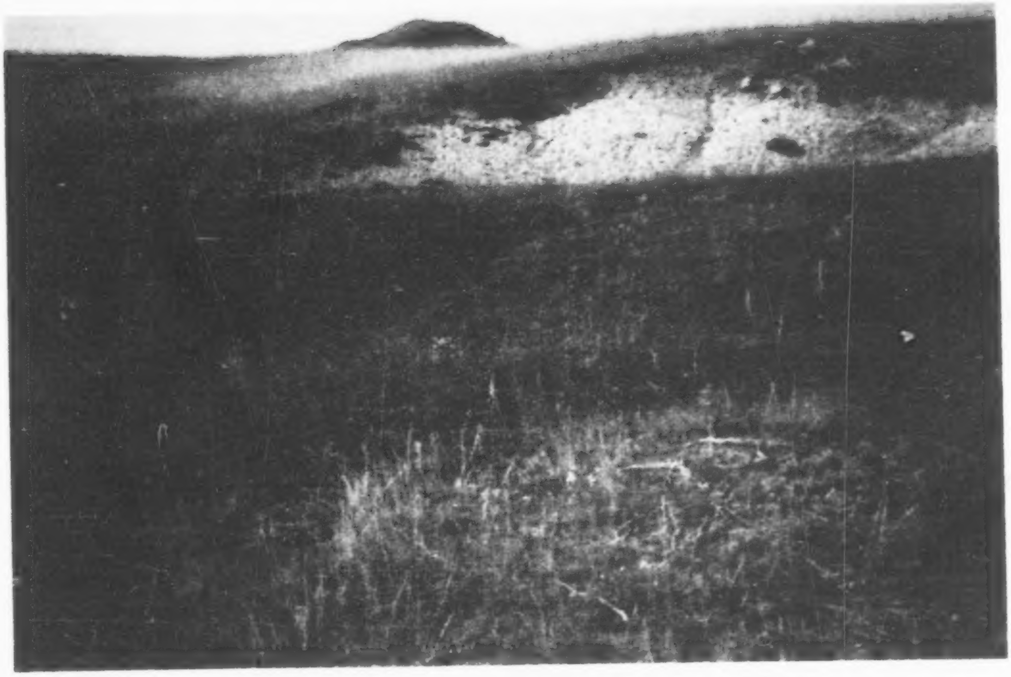

Figure 19. *Juniperus horizontalis* – (*Festuca scabrella*) Dwarf-shrubland type.

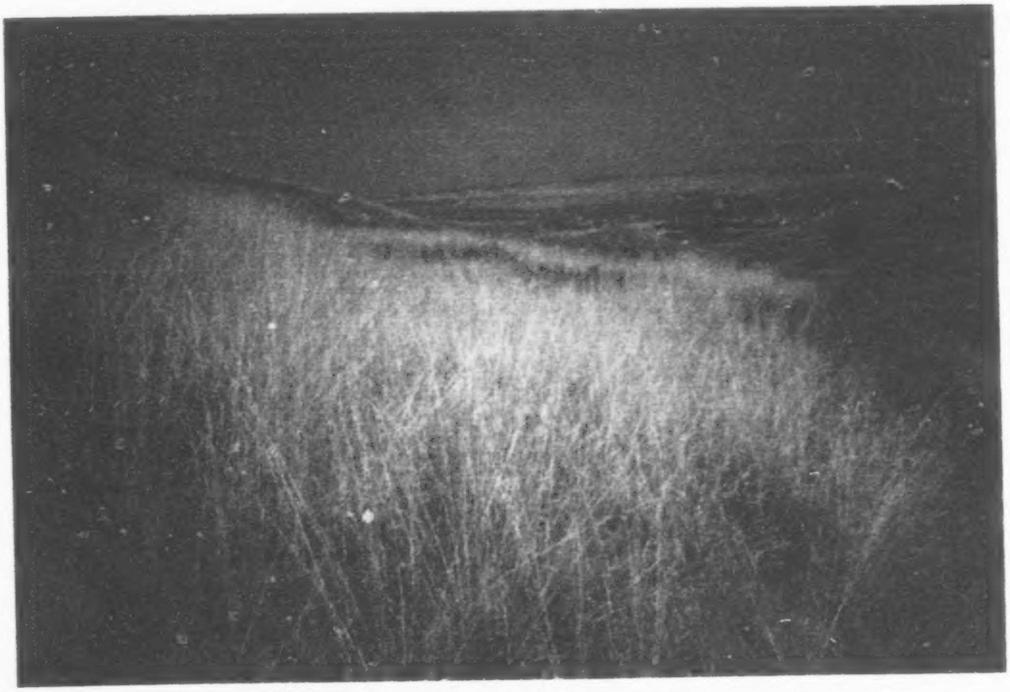

Figure 20. *Festuca scabrella* Herbaceous Vegetation type.

3.3.3.3 *X Agrohordeum* **Herbaceous Vegetation**
Macoun's wild rye Herbaceous Vegetation

DESCRIPTION:

This is minor type in WOSPP and only one releve was completed in the Van Cleeve riparian zone. It occurs as a distinct homogenous plant association and the one patch sampled occurred adjacent to the *Alopecurus aequalis - Glycyrrhiza lepidota - Helianthus nuttallii* Herbaceous Type. Soils are moderately well drained with mesic moisture levels, and mesotrophic (medium) nutrient regimes. There is no shrub layer and the herbaceous layer is a homogenous cover of *X Agrohordeum* (50-75%). *Hordeum jubatum, Asclepias speciosa*, and a minor cover of *Aster ericoides* were recorded adjacent to the 1m^2 plot.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Mesic Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *X Agrohordeum* Herbaceous Alliance
ASSOCIATION: ***X Agrohordeum* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) *X Agrohordeum* is clearly dominant but plot data is limited and no published literature was reviewed for the type. Geographical range of this type is uncertain.

DOMINANT SPECIES: *X Agrohordeum*
CO-DOMINANT SPECIES: None (*Hordeum jubatum, Asclepias speciosa, and Aster ericoides* recorded outside of plot).
DIAGNOSTIC SPECIES: *X Agrohordeum*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: No literature references were located for this type. The species, *X Agrohordeum,* is not rated (S?) in the province (ANHIC 2002).
PLOT NUMBERS: 70

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

3.3.3.4 ***Helianthus nuttallii* Herbaceous Vegetation**
Common tall sunflower Herbaceous Vegetation

DESCRIPTION:

This is a fourth minor type sampled in the Van Cleeve riparian zone that also occurs as a distinct homogenous community type. Soils are moderately well drained with mesic moisture levels, and mesotrophic (medium) nutrient regimes. No shrub layer exists and the herbaceous layer is dominated by *Helianthus nuttallii* (50-75%). Other associated species include *Solidago gigantea* and *Schoenoplectus pungens.*

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Mesic Temperate or Subpolar Perennial Herbaceous Vegetation
ALLIANCE: *Helianthus nuttallii* Herbaceous Alliance
ASSOCIATION: ***Helianthus nuttallii* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) *Helianthus nuttallii* is clearly dominant but plot data is limited and no published literature was reviewed for the type. Geographical range of this type is unknown.

DOMINANT SPECIES: *Helianthus nuttallii*
CO-DOMINANT SPECIES: *Solidago gigantea, Schoenoplectus pungens*
DIAGNOSTIC SPECIES: *Helianthus nuttallii*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3?
RANK JUSTIFICATION: No literature references were located for this type. *Helianthus nuttallii* is rated as S5 in the province (ANHIC 2003). Species is common in its range and was distributed throughout suitable habitat in WOSPP but distinct monocultures are not as common.
PLOT NUMBERS: 72

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

3.3.3.5 ***Distichlis spicata - Iva axillaris* Herbaceous Vegetation**

Salt grass - Poverty weed Herbaceous Vegetation

DESCRIPTION:

This is a minor type (n=1) in WOSPP occurring at seepage sites on coulee slopes. Soils are imperfectly drained with subhydric (moderately wet) and oligotrophic (very poor) nutrient regimes. The surface substrate is predominately mineral soil (70%). Plant species diversity was restricted to *Distichlis spicata* (31%), *Iva axillaris* (15%), and minor amounts of *Pascopyrum smithii, Puccinellia nuttalliana*, and *Hordeum jubatum*.

NatureServe (2003) lists a *Distichlis spicata* Herbaceous Vegetation type (CEGL001687) that occurs in Saskatchewan. This type appears to be similar to the WOSPP type, however, the type described for the current study is associated with seepage sites while this latter type occupies intermittently flooded lowlands. *Iva axillaris* is listed as an associated forb for this type but it also appears to have much higher diversity of species and total herbaceous cover than the WOSPP type. A second type listed by NatureServe (2003) is the *Distichlis spicata - Hordeum jubatum - Puccinellia nuttalliana - Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273). This type occurs in the northeastern and north-central Great Plains and is reported to occur in Manitoba. Both the WOSPP type and this type have low species diversity and total herbaceous cover. Additional sampling is required to determine the relationship between the two types.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Low Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Seepage Alkali-tolerant Temperate or Subpolar Low Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Distichlis spicata* Herbaceous Alliance
ASSOCIATION: ***Distichlis spicata - Iva axillaris* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) This type was observed at several seepage site locations in WOSPP and one plot was completed. Additional information on species composition and geographical range is required.

DOMINANT SPECIES: *Distichlis spicata, Iva axillaris*
CO-DOMINANT SPECIES: *Pascopyrum smithii, Puccinellia nuttalliana, Hordeum jubatum.*
DIAGNOSTIC SPECIES: *Distichlis spicata, Iva axillaris*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: ANHIC (2002) ranks *Distichlis spicata* as S4. Restricted to seepage sites thus limited extent due to small size of patches. NatureServe (2003) does not list this type but reports a *Distichlis spicata* Herbaceous Vegetation (CEGL 001687; G5) and a *Distichlis spicata - Hordeum jubatum - Puccinellia nuttalliana - Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273; G2G3). More information on the WOSPP type is required before assigning a ranking.
PLOT NUMBERS: 76

REFERENCES:

ANHIC 2002. List of Vascular Plant Elements. 2002-11-19. Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

3.3.3.6 ***Bouteloua gracilis - Poa sandbergii* Herbaceous Vegetation**
Blue grama grass - Sandberg bluegrass Herbaceous Vegetation

DESCRIPTION:

This grassland plant association occurs on dry near level portions of floodplains and dry gentle slopes (n=3). Plots sampled in WOSPP indicating soils are well to rapidly drained, moisture levels are xeric, and soil nutrient regime are mesotrophic (medium). Organic materials account for most of the surface substrate but mineral soils may range between 30% to 40%. Generally there is no shrub layer although *Artemisia cana* may occur at low percent cover. *Bouteloua gracilis* (55-70%), and *Poa sandbergii* (1-21%) largely dominate the herbaceous layer. Other plant species include *Artemisia frigida, Sphaeralcea coccinea, Tragopogon dubius, Hesperostipa comata, Elymus lanceolatus*, and *Krascheninnikovia lanata.*

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Xeric Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Bouteloua gracilis* Herbaceous Alliance
ASSOCIATION: ***Bouteloua gracilis - Poa sandbergii* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Variability in species composition of plots and small number of plots completed indicate a need for more sampling to define the type more adequately and establish geographical range.

DOMINANT SPECIES: *Bouteloua gracilis, Poa sandbergii*
CO-DOMINANT SPECIES: *Artemisia frigida, Sphaeralcea coccinea, Tragopogon dubius, Hesperostipa comata, Elymus lanceolatus*, and *Krascheninnikovia lanata.*
DIAGNOSTIC SPECIES: *Bouteloua gracilis, Poa sandbergii, Artemisia frigida, Sphaeralcea coccinea*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: *Poa sandbergii* ranked as S5 in Alberta (ANHIC 2002). No similar types listed by NatureServe (2003) or by Allen (2003).
PLOT NUMBERS: 64,81,83

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

ANHIC. 2002. List of all vascular plant elements (2002-11-19). Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

3.3.3.7 ***Krascheninnikovia lanata -Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation**

Winter-fat - Northern wheat grass - Needle-and-thread grass Herbaceous Vegetation

This plant association is closely related to the *Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation type, however, *Krascheninnikovia lanata* is a dominant species (n=3). It occurs as small patches throughout the Park typically on gentle mid-slope positions (Figure 21). Soils are generally well drained with subxeric moisture and mesotrophic (medium) nutrient regimes. Dominant cover included *Krascheninnikovia lanata* (22-30%), *Elymus lanceolatus* (2-26%), *Hesperostipa comata* (6-23%), *Elymus trachycaulus* (0-25%), Pascopyrum smithii (0-25%), and *Koeleria macrantha* (3-6%). Other species recorded included *Artemisia frigida, Phlox hoodii, Festuca saximontana, Calamovilfa longifolia, Bouteloua gracilis, Distichlis spicata, Muhlenbergia cuspidata, Opuntia polyacantha, Allium textile, Poa sandbergii*, and *Atriplex nuttallii.*

NatureServe (2003) lists an *Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation (CEGL001746) that occurs in Oregon and Washington States. However, *Krascheninnikovia lanata* is not listed as a species associated with this type, there are other significant differences in species composition and site conditions, and the WOSPP type is not within the reported geographical range. Likewise the *Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation type reported by Vujnovic and Bentz (2001) as provincial type does not list *Krascheninnikovia lanata* as an important species.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Graminoid Temperate or Subpolar Perennial Herbaceous Vegetation
ALLIANCE: *Krascheninnikovia lanata* Herbaceous Alliance
ASSOCIATION: ***Krascheninnikovia lanata - Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Relatively common type in WOSPP but limited plot data and no published literature accounts were reviewed. Geographical range of this type is unknown.

DOMINANT SPECIES: *Krascheninnikovia lanata, Elymus lanceolatus, Hesperostipa comata, Elymus trachycaulus*
CO-DOMINANT SPECIES: *Koeleria macrantha, Artemisia frigida, Phlox hoodii, Festuca saximontana, Calamovilfa longifolia, Bouteloua gracilis, Muhlenbergia cuspidata, Opuntia polyacantha, Allium textile, Poa sandbergii, Atriplex nuttallii*
DIAGNOSTIC SPECIES: *Krascheninnikovia lanata, Elymus lanceolatus, Hesperostipa comata, Elymus trachycaulus, Koeleria macrantha, Artemisia frigida*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: *Elymus lanceolatus - Hesperostipa comata* type is ranked provincially as S1S2 by Allen (2003). ANHIC (2002) ranks the species *Krascheninnikovia lanata* as S4. This is a relatively common type in WOSPP but its status provincially uncertain.
PLOT NUMBERS: 13,33,22

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

ANHIC. 2002. List of all vascular plant elements (2002-11-19). Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. (December 22, 2003)

3.3.3.8 ***Hesperostipa comata - Aristida longiseta - Carex filifolia* Herbaceous Vegetation**

Needle-and-thread grass - Red three awn - Thread-leaved sedge Herbaceous Vegetation

This plant association occurs predominately on gentle upper slopes (20-50%) with variable aspects (Figure 22). Soils are rapidly to well drained, xeric and have submesotrophic (poor) nutrient regimes. Surface substrates are 55% to 75% cobble and mineral soil. Analysis of the WOSPP plots resulted in the grouping of four plots together based on similarities in overall plant species composition and site conditions. These plots had many species in common and *Hesperostipa comata* occurred in 4 plots (100% constancy) while *Aristida longiseta* and *Carex filifolia* occurred in 3 of the 4 plots (75% constancy). This community has only minor amounts of shrub cover (<5%) which includes *Rhus trilobata, Artemisia cana, Rosa arkansana*, and *Juniperus communis*. Herbaceous vegetation cover is typically diverse and the dominant species are *Hesperostipa comata* (5-22%), *Aristida longiseta* (0-29%), and *Carex filifolia* (0-33%). Other species with less cover include *Koeleria macrantha* (0-7.3%), *Bouteloua gracilis* (0-16%), *Phlox hoodii, Artemisia frigida, Calamovilfa longifolia, Elymus lanceolatus, Heterotheca villosa, Muhlenbergia cuspidata, Pascopyrum smithii, Eriogonum flavum, Linum rigidum, Liatris punctata, Hymenoxys richardsonii*, and *Selaginella densa*.

NatureServe (2003) lists a *Hesperostipa comata - Carex filifolia* Herbaceous Vegetation type (CEGL001700) that occurs in Montana. This plant association appears to be a similar type but no details regarding species composition are provided. A second type listed on NatureServe (2003) is the *Hesperostipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation type (CEGL002037) that is a common type in the northern and central Great Plains. The community at Plot # 23 was quite similar to the description provided for this latter type, however, *Aristida longiseta* cover was 13.8% at this site.

CLASS: Herbaceous Vegetation

SUBCLASS: Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Xeric Temperate or Subpolar Graminoid Herbaceous Vegetation
ALLIANCE: *Hesperostipa comata* Herbaceous Alliance
ASSOCIATION: ***Hesperostipa comata - Aristida longiseta - Carex filifolia* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Plots completed in WOSPP had relatively good constancy of plant species and the indicator species were typically present at elevated percent cover values. Additional sampling is required to describe the type more adequately and establish geographical range.

DOMINANT SPECIES: *Hesperostipa comata, Aristida longiseta, Carex filifolia, Koeleria macrantha*
CO-DOMINANT SPECIES: *Bouteloua gracilis, Phlox hoodii, Artemisia frigida, Calamovilfa longifolia, Elymus lanceolatus, Heterotheca villosa, Muhlenbergia cuspidata, Pascopyrum smithii, Eriogonum flavum, Linum rigidum, Liatris punctata*, and *Hymenoxys richardsonii, Selaginella densa*
DIAGNOSTIC SPECIES: *Hesperostipa comata, Aristida longiseta, Carex filifolia, Eriogonum flavum, Calamovilfa longifolia, Koeleria macrantha, Phlox hoodii*

PROPOSED PROVINCIAL CONSERVATION RANKING: S1?
RANK JUSTIFICATION: NatureServe (2003) ranks the *Hesperostipa comata - Carex filifolia* Herbaceous Vegetation type (CEGL001700) as G4 globally and the *Hesperostipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation type (CEGL002037) is ranked G5. Provincially *Aristida purpurea* var *longiseta* is ranked S1 and *Carex filifolia* is ranked S4 by ANHIC (2002). In WOSPP, this type appears to be relatively common but has restricted areal extent.
PLOT NUMBERS: 23,24,37,42

REFERENCES:

Allen, L. 2003. Alberta Natural Heritage Information Centre preliminary plant community tracking list, Alberta Community Development, Edmonton, Alberta.

ANHIC. 2002. List of all vascular plant elements (2002-11-19). Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 22, 2003).

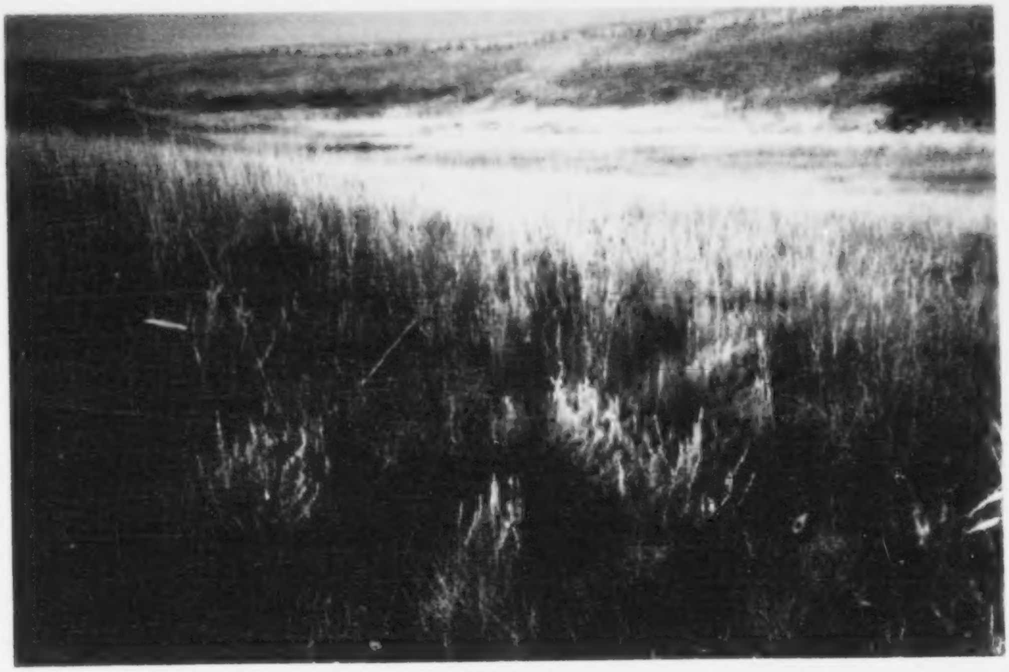

Figure 21. *Krascheninnikovia lanata - Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation.

Figure 22. *Hesperostipa comata - Aristida longiseta - Carex filifolia* Herbaceous Vegetation type.

3.3.3.9 *Achnatherum hymenoides - Hesperostipa comata* Herbaceous Vegetation
Indian rice grass - Needle-and-thread grass

In WOSPP, this type is distributed throughout the coulees on dry sites with sandy soils but is restricted mainly to south facing slopes below the hoodoos east of the rodeo grounds. Patch sizes are small and only one 1000m^2 stand was sampled (Figure 23). It occurred on a southwest facing lower slope with a gentle (20%) inclination. Surface substrates are primarily organic (60%) and mineral soil (40%). Soils are rapidly drained with xeric moisture levels and have submesotrophic (poor) nutrient regimes. *Achnatherum hymenoides* is the dominant ground cover (32%) followed by *Hesperostipa comata* (20%). Other minor species associated with this type include *Sphaeralcea coccinea, Poa sandbergii, Lithospermum ruderale, Salsola kali, Artemisia frigida*, and *Astragalus* spp.

NatureServe (2003) lists two similar types *Hesperostipa comata - Achnatherum hymenoides* Herbaceous Vegetation (CEGL001703) reported from Wyoming and the *Calamovilfa longifolia - Achnatherum hymenoides* Herbaceous Vegetation (CEGL002219) reported from Saskatchewan. No detailed species accounts or data on site conditions are provided and the relationship between the WOSPP type and these previously described types is uncertain.

CLASS: Herbaceous Vegetation

SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Grassland
SUBGROUP: Natural/Semi-natural
FORMATION: Medium-tall Bunch Temperate or Subpolar Grassland
ALLIANCE: *Achnatherum hymenoides* Herbaceous Alliance
ASSOCIATION: ***Achnatherum hymenoides - Hesperostipa comata* Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Appears to be a distinct type but limited plot data (n=1) and uncertain relationship to published types. Geographical range of this type is unknown.

DOMINANT SPECIES: *Achnatherum hymenoides Hesperostipa comata,*
CO-DOMINANT SPECIES: *Sphaeralcea coccinea, Poa sandbergii, Lithospermum ruderale, Salsola kali, Artemisia frigida*, and *Astragalus* spp.
DIAGNOSTIC SPECIES: *Achnatherum hymenoides Hesperostipa comata,*

PROPOSED PROVINCIAL CONSERVATION RANKING: S2?
RANK JUSTIFICATION: Allen (2003) ranks *Achnatherum hymenoides - Elymus canadensis* provincially as S2. NatureServe (2003) globally ranks the *Hesperostipa comata - Achnatherum hymenoides* Herbaceous Vegetation (CEGL001703) as G2?, and the *Calamovilfa longifolia - Achnatherum hymenoides* Herbaceous Vegetation (CEGL002219) as G?. The plant species *Achnatherum hymenoides* is provincially ranked as S3S4 (ANHIC 2002). In WOSPP, this type is occurs in small patches and it has limited areal extent.
PLOT NUMBERS: 43

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3.3.3.10 Distichlis spicata - (Koeleria macrantha) - (Stipa viridula) Herbaceous Vegetation

Salt grass - (June grass) – (Green needle grass) Herbaceous Vegetation

This type is a minor type in WOSPP and the one site sampled occurred on a gentle upper slope above Police Creek (Figure 24). Soils are well drained with xeric soil moisture levels and submesotrophic (poor) nutrient regimes. This type is similar to the *Distichlis spicata - Gutierrezia sarothrae* Sparse Vegetation Type. However, organic matter accounts for 75% of the surface substrate and cobble content is only 5%. Total vegetation cover is also much higher (56%) and is dominated by *Distichlis spicata* (34%), *Koeleria macrantha* (7%), and *Stipa viridula* (3%). Other plant species recorded were *Phlox hoodii, Elymus lanceolatus, Anemone multifida, Artemisia frigida, Krascheninnikovia lanata, Artemisia ludoviciana, Tragopogon dubius, Linum lewisii, Achillea millefolium, Allium cernuum, Geum triflorum, Hedysarum boreale, Selaginella densa, Erigeron caespitosus,* and *Petalostemon purpureum.*

Three similar NatureServe (2003) types were compared to the WOSPP type. These including *Distichlis spicata - Hordeum - Puccinellia nuttalliana - Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273), *Pascopyrum smithii - Distichlis spicata* Herbaceous Vegetation (CEGL001580), and *Distichlis spicata* Herbaceous Vegetation (CEGL001770). While the WOSPP type occurs on similar sites there are important differences in the dominant and diagnostic plant species and none of these types appeared to be a good fit. None of these types indicated *Stipa viridula* to be an important co-dominant species.

CLASS: Herbaceous Vegetation
SUBCLASS: Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Grassland
SUBGROUP: Natural/Semi-natural
FORMATION: Temporarily Flooded Temperate or Subpolar Grassland
ALLIANCE: *Distichlis spicata* Herbaceous Alliance
ASSOCIATION: ***Distichlis spicata* - (*Koeleria macrantha*) - (*Stipa viridula*) Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) Limited plot data and no reference to this particular type in the literature. Geographical range of this type is unknown.

DOMINANT SPECIES: *Distichlis spicata, Koeleria macrantha, Stipa viridula*
CO-DOMINANT SPECIES: *Elymus lanceolatus, Anemone multifida Artemisia frigida, Krascheninnikovia lanata, Artemisia ludoviciana, Tragopogon dubius, Linum lewisii, Achillea millefolium, Allium cernuum, Geum triflorum, Hedysarum boreale, Selaginella densa Erigeron caespitosus, Petalostemon purpureum.*
DIAGNOSTIC SPECIES: *Distichlis spicata, Koeleria macrantha, Stipa viridula, Phlox hoodii, Artemisia frigida*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: ANHIC (2002) ranks *Distichlis spicata* as S4. NatureServe (2003) ranks *Distichlis spicata - Hordeum - Puccinellia nuttalliana - Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273) as G2G3, *Pascopyrum smithii - Distichlis spicata* Herbaceous Vegetation (CEGL001580) as G4, and the *Distichlis spicata* Herbaceous Vegetation (CEGL001770) as G5. Provincial status and distribution uncertain and it is an minor type in WOSPP.
PLOT NUMBERS: 26

REFERENCES:

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Figure 23. *Achnatherum hymenoides - Hesperostipa comata* Herbaceous Vegetation type.

Figure 24. *Distichlis spicata* - (*Koeleria macrantha*) - (*Stipa viridula*) Herbaceous Vegetation type.

3.3.3.11 ***Muhlenbergia cuspidata - Hesperostipa comata*** **Herbaceous Vegetation**
Plains Muhly - Needle-and-thread grass Herbaceous Vegetation

In WOSPP (n=3), this community typically occurs on dry south to southwest facing aspects at upper to midslope positions along coulee ridges (Figure 25). Slopes typically are gentle at 30% but may range up to 80% on steeper sites. Exposed soil, cobble and rock cover is high at 60 to 75%. A combination of coarse textured soils and significant slopes result in rapid drainage and xeric moisture conditions with submesotrophic (poor) nutrient regimes. Dominant plant species include *Muhlenbergia cuspidata, Hesperostipa comata, Koeleria macrantha, Gutierrezia sarothrae, Elymus lanceolatus, Artemisia frigida,* and *Calamovilfa longifolia.* Other associate species include *Phlox hoodii, Eriogonum flavum, Allium textile, Hymenoxys acaulis, Bouteloua gracilis, Linum lewisii,* and *Carex filifolia.*

NatureServe (2004) describes a *Schizachyrium scoparium - Muhlenbergia cuspidata* Herbaceous Vegetation (CEGL001683), which occurs in the northern Great Plains including Montana and potentially Saskatchewan. This association type appears to be very similar to the one sampled in WOSPP although no *Schizachyrium scoparium* was recorded at the WOSPP site. Additional sampling may detect the presence of *Schizachyrium scoparium* and result in reclassification to the NatureServe type.

CLASS: Herbaceous Vegetation
SUBCLASS: Perennial Graminoid Herbaceous Vegetation
GROUP: Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Xeric Temperate or Subpolar Perennial Graminoid Herbaceous Vegetation
ALLIANCE: *Muhlenbergia cuspidata* Herbaceous Alliance
ASSOCIATION: ***Muhlenbergia cuspidata - Hesperostipa comata*** **Herbaceous Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 3 (Weak) May be same type as the NatureServe (2003) type identified above. Additional sampling should be completed to confirm this and determine geographical range.

DOMINANT SPECIES: *Muhlenbergia cuspidata, Hesperostipa comata, Koeleria macrantha*
CO-DOMINANT SPECIES: *Calamovilfa longifolia, Elymus lanceolatus, Phlox hoodii, Artemisia frigida, Eriogonum flavum, Gutierrezia sarothrae*
DIAGNOSTIC SPECIES: *Muhlenbergia cuspidata, Hesperostipa comata, Calamovilfa longifolia, Koeleria macrantha, Elymus lanceolatus, Phlox hoodii, Artemisia frigida, Eriogonum flavum, Gutierrezia sarothrae*

PROPOSED PROVINCIAL CONSERVATION RANKING: S3?
RANK JUSTIFICATION: Both *Muhlenbergia cuspidata* and *Hesperostipa comata* are relatively common and wide spread throughout the lower half of Alberta (Moss 1983). *Muhlenbergia cuspidata* is ranked S4 and *Hesperostipa comata* is S5 listed by ANHIC (2002). NatureServe ranks the similar *Schizachyrium scoparium - Muhlenbergia cuspidata* Herbaceous Vegetation as G3? In WOSPP, this type is restricted to the leading edge of eroded slopes, ridges and dry sites on south facing aspects.
PLOT NUMBERS: 25,32,46

REFERENCES:

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3.3.4 SPARSE VEGETATION

3.3.4.1 Distichlis spicata - Gutierrezia sarothrae Badlands Sparse Vegetation

Salt grass - Broomweed Badlands Sparse Vegetation

This habitat type (n=4) occurs throughout the coulees of WOSPP in small patches of less than 300m^2 (Figure 26). Sites appear to occur on erosional outwashes at the base of sections of steeper slopes. Aspects are variable and at the plots sampled slopes ranged from 10% to 35%. The surface substrate is clearly dominated by cobble (>70%) with a lesser amount of mineral soil (5%). Sites are rapidly to very rapidly drained with very xeric soil moisture levels and oligotrophic (very poor) nutrient regimes. Total vegetation cover is generally under 25% and consists of *Distichlis spicata* (2-15%), *Gutierrezia sarothrae* (0-10%), *Grindelia squarrosa* (0-3%), *Krascheninnikovia lanata* (0-2%), and *Ericameria nauseosa* (0-2%). Other frequent plant species include *Eriogonum flavum, Pascopyrum smithii, Atriplex* nuttallii, *Hymenoxys richardsonii, Iva axillaris, Hesperostipa comata, Bouteloua gracilis*, and *Phlox hoodii*.

NatureServe (2003) describes an *Artemisia longifolia* Badlands Sparse Vegetation (CEGL002195) that occurs in North and South Dakota. This type has similarities with the WOSPP type in terms of habitat and species composition yet the WOSPP plots lacked *Artemisia longifolia*. A second type is the Eroding Great Plains Badlands Sparse Vegetation (CEGL002050) that occur in the Dakotas and potentially Saskatchewan. This type appears to have less cobble content and is more typical on finer clay soils with substantially less vegetation cover. It is also generally restricted to highly eroded slopes and badland walls. The third type listed by NatureServe (2003) is the *Eriogonum pauciflorum - Gutierrezia sarothrae* Badlands Sparse Vegetation (CEGL005270) that is reported to occur in the Dakotas and potentially in Montana. This type is also similar to the WOSPP type but vegetation cover is generally less than 5% and rarely exceeds 10%. None of these types reviewed above indicated the presence of *Distichlis spicata*.

CLASS: Sparse Vegetation
SUBCLASS: Unconsolidated Sparse Vegetation
GROUP: Temperate or Subpolar Cobble Dominated Sparse Vegetation
SUBGROUP: Natural/Semi-natural
FORMATION: Dry Slope Temperate or Subpolar Cobble Dominated Sparse Vegetation
ALLIANCE: *Distichlis spicata* Sparse Vegetation Alliance
ASSOCIATION: ***Distichlis spicata - Gutierrezia sarothrae* Badlands Sparse Vegetation**
CLASSIFICATION CONFIDENCE LEVEL: 2 (Moderate) Appears to be a distinct type in WOSPP however only three plots were completed and the geographical range is uncertain.

DOMINANT SPECIES: *Distichlis spicata, Gutierrezia sarothrae, Grindelia squarrosa, Krascheninnikovia lanata, Ericameria nauseosa*
CO-DOMINANT SPECIES: *Eriogonum flavum, Hymenoxys richardsonii, Iva axillaris Pascopyrum smithii, Phlox hoodii, Atriplex nuttallii, Hesperostipa comata, Bouteloua gracilis,*
DIAGNOSTIC SPECIES: *Gutierrezia sarothrae, Grindelia squarrosa, Ericameria nauseosa, Eriogonum flavum, Hymenoxys richardsonii*

PROPOSED PROVINCIAL CONSERVATION RANKING: SU
RANK JUSTIFICATION: NatureServe (2003) ranks Artemisia *longifolia* Badlands Sparse Vegetation (CEGL002195) as G?, *Eriogonum pauciflorum - Gutierrezia sarothrae* Badlands Sparse Vegetation CEGL005270) as G4G5, and Eroding Great Plains Badlands Sparse Vegetation (CEGL002050) as G4G5. Restricted to coulee and badland areas and supports plant species specialised to inhabit xeric habitats. There currently is no similar listing by Allen (2003).
PLOT NUMBERS: 18,34,36,45

REFERENCES:

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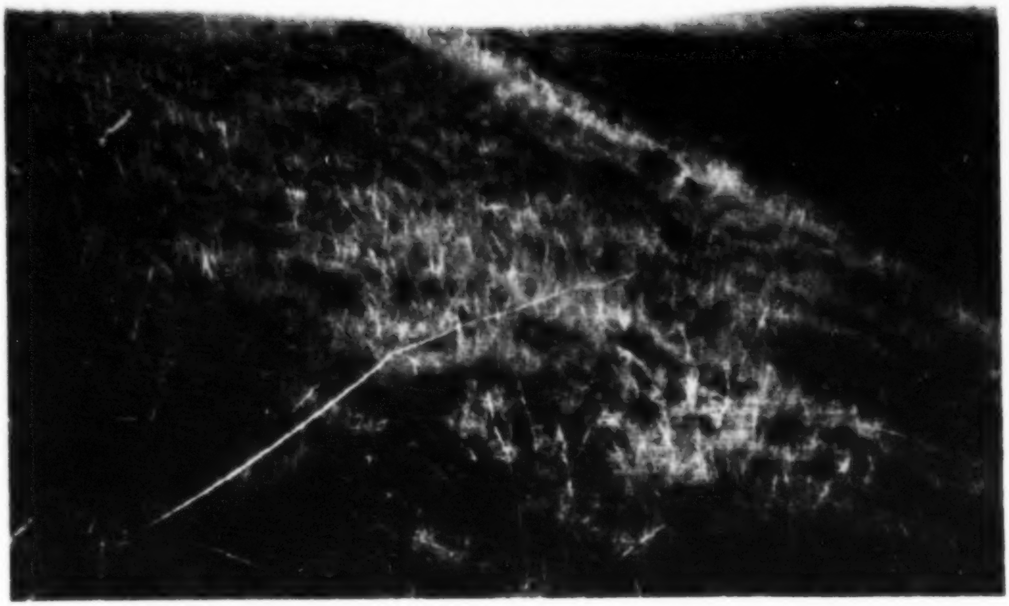

Figure 25. *Muhlenbergia cuspidata / Hesperostipa comata* Herbaceous Vegetation type.

Figure 26. *Distichlis spicata - Gutierrezia sarothrae* Badlands Sparse Vegetation type.

4.0 LITERATURE CITED

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APPENDICES

Appendix I. **Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.**

Main Stratum/Species	Common Name	Code	Strata	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
Tree Layer																			
Populus angustifolia	narrow-leaf cottonwood	POPANG	T1	20.0															
Populus angustifolia	narrow-leaf cottonwood	POPANG	T2																
Populus balsamifera	balsam poplar	POPBAL	T1																
Populus deltoides	plains cottonwood	POPDEL	T1																
Populus x acuminata	lance-leaf cottonwood	POPACU	T1																
Salix amygdaloides	peach-leaved willow	SALIAMY	T1																
Shrub Layer																			
Betula occidentalis	water birch	BETUOCC	S1																
Cornus stolonifera	red-osier dogwood	CORNSTO	S1	5.0															
Prunus virginiana	choke cherry	PRUNVIR	S1	5.0		85.0	0.3												
Salix lutea	yellow willow	SALILUT	S1																
Salix lutea	yellow willow	SALILUT	S2																
Shepherdia argentea	thorny buffaloberry	SHEPARG	S1																
Amelanchier alnifolia	saskatoon	AMELALN	S2																
Artemisia cana	silver sagebrush	ARTECAN	S2																
Clematis ligusticifolia	western clematis	CLEMLIG	S2	0.5		15.0													
Cornus stolonifera	red-osier dogwood	CORNSTO	S2																
Elaeagnus commutata	silverberry	ELAECOM	S2																
Juniperus communis	ground juniper	JUNICOM	S2				39.0												
Prunus virginiana	choke cherry	PRUNVIR	S2																
Rhus trilobata	skunkbush	RHUSTRI	S2																
Ribes aureum	golden currant	RIBEAUR	S2																
Ribes oxyacanthoides	northern gooseberry	RIBEOXY	S2																
Rosa acicularis	prickly rose	ROSAACI	S2			2.0													
Rosa arkansana	prairie rose	ROSAARK	S2																
Rosa woodsii	common wild rose	ROSAWOO	S2	3.0														3.0	
Salix exigua	sandbar willow	SALIEXI	S2																
Salix sp	Unknown willow	SALI$$$	S2	1.0															
Symphoricarpos occidentalis	buckbrush	SYMPOCC	S2	20.0		5.0				45.0								57.0	57.0
Arctostaphylos uva-ursi	common bearberry	ARCTUVA	S3																
Artemisia cana	silver sagebrush	ARTECAN	S3		3.0		1.0	12.0			0.3								
Chrysothamnus nauseosus	rabbitbrush	CHRYNAU	S3											0.5			0.3		
Gutierrezia sarothrae	broomweed	GUTISAR	S3											0.3					
Juniperus horizontalis	creeping juniper	JUNIHOR	S3				0.3						6.0						
Rhus radicans	poison ivy	RHUSRAD	S3																
Rhus trilobata	skunkbush	RHUSTRI	S3																
Ribes aureum	golden currant	RIBEAUR	S3			0.5													
Rosa arkansana	prairie rose	ROSAARK	S3																
Sarcobatus vermiculatus	greasewood	SARCVER	S3											9.0			37.0		
Symphoricarpos occidentalis	buckbrush	SYMPOCC	S3					1.0											
Herb Layer																			
Achillea millefolium	common yarrow	ACHIMIL	H				0.6												
Agropyron cristatum		AGROCRI	H																
Agropyron pectiniforme	crested wheat grass	AGRODAS	H					4.0						0.3	8.0	2.0	0.1		
Agropyron smithii	western wheat grass	AGROSMI	H		47.0			1.0											
Agropyron spp	wheat grass	AGRO$$$	H																
Agrostis scabra	rough hair grass	AGROSCA	H																
Allium textile	prairie onion	ALLITEX	H																
Alopecurus aequalis	short-awned foxtail	ALOPAEQ	H																
Anemone multifida	cut-leaved anemone	ANEMMUL	H												1.0				
Antenaria spp	antenaria spp	ANTE$$$	H																
Arctium minus	common burdock	ARCTMIN	H	0.5		3.0													
Aristida purpurea var longiseta	red three-awn	ARISLON	H																
Artemisia frigida	pasture sagewort	ARTEFRI	H				0.3	0.3			0.6	2.0			0.5				
Artemisia ludoviciana	prairie sagewort	ARTELUD	H								0.3								
Asclepias speciosa	showy milkweed	ASCLSPE	H																
Aster ericoides	tufted white prairie aster	ASTEERI	H																
Aster laevis	smooth aster	ASTELAE	H																
Astragalus flexuosus	slender milk vetch	ASTRFLE	H				2.0												
Astragalus missouriensis	Missouri milk vetch	ASTRMIS	H																
Astragalus pectinatus	narrow-leaved milk vetch	ASTRPEC	H																
Astragalus spp	milk vetch spp	ASTR$$$	H	0.5															
Astragalus striatus	ascending purple milk vetch	ASTRSTR	H								2.0	0.5							
Atriplex argentea	silver saltbush	ATRIARG	H																
Atriplex nuttallii	Nuttall's atriplex	ATRINUT	H											4.0			1.0		
Atriplex spp	atriplex spp	ATRI$$$	H																
Bouteloua gracilis	blue grama	BOUTGRA	H					0.1											
Bromus inermis	awnless brome	BROMINE	H	15.0															
Bromus tectorum	downy chess	BROMTEC	H																
Calamagrostis inexpansa	northern reed grass	CALAINE	H																
Calamagrostis montanensis	plains reed grass	CALAMON	H																
Calamovilfa longifolia	sand grass	CALALON	H					1.0			0.3	30.0			31.0				
Campanula rotundifolia	harebell	CAMPROT	H																
Carex filifolia	thread-leaved sedge	CAREFIL	H									0.3							
Carex heleonastes	Hudson Bay sedge	CAREHEL	H				1.0												
Carex siccata	hay sedge	CARESIC	H																
Carex spp	sedge spp	CARE$$$	H			0.5													
Carex stenophylla	low sedge	CARESTE	H																
Cerastium arvense	field mouse-ear chickweed	CERAARV	H	0.5															
Cirsium arvense	Canada thistle	CIRSARV	H							1.0								1.0	4.0
Comandra umbellata	bastard toadflax	COMAUMB	H									0.3							
Deschampsia cespitosa	tufted hair grass	DESCCES	H																
Descurainia pinnata	green tansy mustard	DESCPIN	H																
Descurainia sophia	flixweed	DESCSOP	H			0.5													
Distichlis stricta	salt grass	DISTSTR	H											1.0			9.0		
Elymus canadensis	Canada wild rye	ELYMCAN	H			1.0													
Elymus piperi	giant wild rye	ELYMPIP	H							24.0								21.0	29.0
Elymus trachycaulus	slender wheatgrass	AGROTRA	H				0.6		0.3		2.0	1.0				24.0			
Elytrigia repens var repens	quack grass	AGROREP	H																
Equisetum arvense	common horsetail	EQUIARV	H	0.5					47.0										

Appendix I. **Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.**

Main Stratum/Species	Common Name	Code	Strata	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
Erigeron caespitosus	tufted fleabane	ERIGCAE	H																
Eriogonum flavum	yellow umbrella-plant	ERIOFLA	H																
Eriophorum gracile	slender cotton grass	ERIOGRA	H																
Eurotia lanata	winter-fat	EUROLAN	H								1.0					21.0	0.3		
Festuca saximontana	Rocky Mountain fescue	FESTSAX	H				0.3									0.5	0.4		
Festuca scabrella	rough fescue	FESTSCA	H								29.0	0.3	47.0						
Galium aparine	cleavers	GALIAPA	H			12.0													
Galium boreale	northern bedstraw	GALIBOR	H	2.0			0.3						0.8						
Gaura coccinea	scarlet butterflyweed	GAURCOC	H																
Geum triflorum	three-flowered avens	GEUMTRI	H				0.3												
Glycyrrhiza lepidota	wild licorice	GLYCLEP	H						64.0										
Grindelia squarrosa	gumweed	GRINSQU	H																
Helianthus annuus	common annual sunflower	HELIANN	H	0.5															
Helianthus nuttallii	common tall sunflower	HELINUT	H																
Heracleum lanatum	cow parsnip	HERALAN	H	0.5		0.5													
Hesperis matronalis	dame's rocket	HESPMAT	H			1.0													
Heterotheca villosa	golden aster	HETEVIL	H								0.1	0.3							
Hordeum jubatum	foxtail barley	HORDJUB	H			0.5											0.5		
Hymenoxys acaulis	butte marigold	HYMEACA	H																
Hymenoxys richardsonii	Colorado rubber-plant	HYMERIC	H																
Iva axillaris	povertyweed	IVAAXIL	H																
Iva xanthifolia	false ragweed	IVAXANT	H																
Juncus balticus	wire rush	JUNCBAL	H																
Juncus stygius	rush	HEDYBOR	H																
Koeleria macrantha	June grass	KOELMAC	H				0.8	0.3			2.0	0.8			1.0	5.0			
Lappula squarrosa	bluebur	LAPPSQU	H			0.5													
Liatris punctata	dotted blazingstar	LIATPUN	H									0.3			0.3				
Linum lewisii	wild blue flax	LINULEW	H		0.1							1.0			0.2				
Linum rigidum	yellow flax	LINURIG	H																
Lithospermum incisum	narrow-leaved puccoon	LITHINC	H																
Lithospermum ruderale	woolly gromwell	LITHRUD	H								0.1								
Lygodesmia juncea	skeletonweed	LYGOJUN	H																
Melilotus alba	white sweet-clover	MELIALB	H	0.5															
Melilotus officinalis	yellow sweet-clover	MELIOFF	H	0.5			0.1												
Mentha arvensis	wild mint	MENTARV	H							14.0									
Monarda fistulosa	wild bergamot	MONAFIS	H																
Muhlenbergia cuspidata	plains muhly	MUHLCUS	H									0.3							
Nepeta cataria	catnip	NEPECAT	H																
Oenothera biennis	yellow evening-primrose	OENOBIE	H																
Opuntia polyacantha	prickly-pear	OPUNPOL	H																
Oryzopsis hymenoides	Indian rice grass	ORYZHYM	H																
Oxytropis sericea	early yellow locoweed	OXYTSER	H								1.0								
Paronychia sessiliflora	low whitlow-wort	PAROSES	H																
Penstemon nitidus	smooth blue beardtongue	PENSNIT	H				0.1												
Perideridia gairdneri	squawroot	PERIGAI	H																
Petalostemon candidum	white prairie-clover	PETACAN	H									1.0							
Petalostemon purpureum	purple prairie-clover	PETAPUR	H																
Phalaris arundinacea	reed canary grass	PHALARU	H																
Phlox hoodii	moss phlox	PHLOHOO	H				0.8	0.1											
Plantago major	common plantain	PLANMAJ	H																
Plantago patagonica	Pursh's plantain	PLANPAT	H																
Poa canbyi	Canby bluegrass	POACANB	H																
Poa cusickii	early bluegrass	POACUSI	H																
Poa juncifolia	alkali bluegrass	POAJUN	H																
Poa pratensis	Kentucky bluegrass	POAPRAT	H	37.0		5.0				0.1								14.0	14.0
Poa sandbergii	Sandberg bluegrass	POASAND	H				1.0												
Potentilla anserina	silverweed	POTEANS	H																
Potentilla palustris	marsh cinquefoil	POTEPAL	H																
Salsola kali	Russian-thistle	SALSKAL	H																
Scirpus pungens	three-square rush	SCIRPUN	H																
Selaginella densa	prairie selaginella	SELADEN	H								0.3								
Senecio canus	prairie groundsel	SENECAN	H									0.1							
Smilacina racemosa	false Solomon's-seal	SMILRAC	H			1.0													
Smilacina stellata	star-flowered Solomon's-seal	SMILSTE	H	0.5														0.5	
Solidago gigantea	late goldenrod	SOLIGIG	H	37.0															
Solidago missouriensis	low goldenrod	SOLIMIS	H																
Sonchus arvensis	perennial sow-thistle	SONCARV	H																
Sonchus sp	Unknown sow-thistle	SONC$$$	H	0.5		0.5													
Spartina gracilis	alkali cord grass	SPARGRA	H																
Sphaeralcea coccinea	scarlet mallow	SPHACOC	H																
Stipa comata	needle-and-thread	STIPCOM	H												7.0	23.0			
Stipa viridula	green needle grass	STIPVIR	H		7.0			20.0											
Taraxacum officinale	common dandelion	TARAOFF	H																
Thalictrum venulosum	veiny meadow rue	THALVEN	H	15.0		3.0				3.0								4.0	
Thermopsis rhombifolia	golden bean	THERRHO	H				0.5				9.0	2.0							
Thlaspi arvense	stinkweed	THLAARV	H																
Tragopogon dubius	common goat's-beard	TRAGDUB	H					0.1			0.1				0.5				
Unknown Cruciferae	Unkown Cruciferae	CRUCIFER	H		0.1														
Urtica dioica	common nettle	URTIDIO	H			5.0				6.0								15.0	
Vicia americana	wild vetch	VICIAME	H	2.0							1.0								
X agrohordeum macounii	Macoun's wild rye	XAGROMAC	H																
Lichen	Lichen	Lichen	L																

Appendix I. **Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.**

Main Stratum/Species	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P29	P30	P31	P32	P33	P34	P35	P36	P37	P38	P39	P40	P41
Tree Layer																									
Populus angustifolia																									
Populus angustifolia																									
Populus balsamifera																									
Populus deltoides																									
Populus x acuminata																									
Salix amygdaloides																									
Shrub Layer																									
Betula occidentalis																									
Cornus stolonifera																									
Prunus virginiana																									
Salix lutea																									
Salix lutea																									
Shepherdia argentea																									
Amelanchier alnifolia				4.0											0.5										
Artemisia cana																									
Clematis ligusticifolia																									
Cornus stolonifera														1.0											
Elaeagnus commutata															0.3										
Juniperus communis				3.0								23.0			52.0										
Prunus virginiana																									
Rhus trilobata																									
Ribes aureum																									
Ribes oxyacanthoides														1.0											
Rosa acicularis																									
Rosa arkansana				0.3																					
Rosa woodsii														1.0										7.0	
Salix exigua														80.0											
Salix sp																									
Symphoricarpos occidentalis			1.0	3.0				0.3							1.0									69.0	
Arctostaphylos uva-ursi																									
Artemisia cana			26.0									19.0	17.0						7.0						
Chrysothamnus nauseosus		1.0			3.0															1.0					
Gutierrezia sarothrae		9.0			0.3	0.3										0.1		3.0							
Juniperus horizontalis															0.3										
Rhus radicans																									
Rhus trilobata			14.0					1.0					43.0						33.0						
Ribes aureum																									
Rosa arkansana																									
Sarcobatus vermiculatus	55.0				31.0						36.0														
Symphoricarpos occidentalis																									
Herb Layer																									
Achillea millefolium												0.3													
Agropyron cristatum																			0.3					0.1	
Agropyron pectiniforme								3.0	1.0	1.0		3.0				5.0	25.0		4.0		0.3		2.0		
Agropyron smithii			14.0	0.3	1.0	25.0	2.0						11.0		0.1			0.1				0.5			
Agropyron spp																									
Agrostis scabra																									
Allium textile									0.1																
Alopecurus aequalis																									
Anemone multifida										1.0		1.0			0.1										
Antenaria spp																									
Arctium minus														0.5											
Aristida purpurea var longiseta							13.0	29.0	10.0												15.0				
Artemisia frigida						1.0	1.0	1.0		0.5		0.3				1.0			0.3		1.0	1.0	1.0		3.0
Artemisia ludoviciana			0.5							0.1			0.3												
Asclepias speciosa																									
Aster ericoides																									
Aster laevis																									
Astragalus flexuosus																									
Astragalus missouriensis																									
Astragalus pectinatus																0.3									
Astragalus spp																									
Astragalus striatus																									
Atriplex argentea																		1.0							
Atriplex nuttallii	10.0	1.0			6.0						1.0														
Atriplex spp																									
Bouteloua gracilis						0.3	16.0									1.0	0.3		1.0				20.0		
Bromus inermis																									
Bromus tectorum																									
Calamagrostis inexpansa																									
Calamagrostis montanensis													0.1				1.0								
Calamovilfa longifolia							0.3		6.0						0.1										35.0
Campanula rotundifolia																									
Carex filifolia							18.0												7.0		9.0				0.5
Carex heleonastes																									
Carex siccata																									
Carex spp																									
Carex stenophylla																									
Cerastium arvense																									
Cirsium arvense														2.0											
Comandra umbellata																									
Deschampsia cespitosa																									
Descurainia pinnata																									
Descurainia sophia																									
Distichlis stricta		12.0				6.0				33.0	0.1							4.0		14.0					
Elymus canadensis																									
Elymus piperi																									
Elymus trachycaulus												2.0													
Elytrigia repens var repens																								0.1	
Equisetum arvense																									

Appendix I. **Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.**

Main Stratum/Species	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P29	P30	P31	P32	P33	P34	P35	P36	P37	P38	P39	P40	P41
Erigeron caespitosus												0.1													
Eriogonum flavum		0.3						3.0								0.5									
Eriophorum gracile							0.1																		
Eurotia lanata						20.0				0.1							29.0								
Festuca saximontana	1.0				0.3	1.0																			
Festuca scabrella				66.0																					
Galium aparine																									
Galium boreale				0.3											0.1										
Gaura coccinea																									
Geum triflorum																									
Glycyrrhiza lepidota																									
Grindelia squarrosa																		3.0		0.1					
Helianthus annuus																									
Helianthus nuttallii																									
Heracleum lanatum														2.0											
Hesperis matronalis																									
Heterotheca villosa																					1.0				
Hordeum jubatum																									
Hymenoxys acaulis																1.0									
Hymenoxys richardsonii					1.0	1.0		1.0										0.3							
Iva axillaris																									
Iva xanthifolia																									
Juncus balticus																									
Juncus stygius																									
Koeleria macrantha			1.0				0.5	0.5	6.0	7.0		0.3	1.0		0.8	10.0	3.0				1.0				4.0
Lappula squarrosa																								0.5	
Liatris punctata			0.3					1.0													0.8				0.1
Linum lewisii			1.0													0.5									
Linum rigidum								1.0																	
Lithospermum incisum																									
Lithospermum ruderale				6.0																					
Lygodesmia juncea								0.3																	
Melilotus alba																									
Melilotus officinalis																									
Mentha arvensis														2.0										1.0	
Monarda fistulosa																									
Muhlenbergia cuspidata							1.0		16.0							22.0									
Nepeta cataria																									
Oenothera biennis																									
Opuntia polyacantha													4.0												
Oryzopsis hymenoides	0.1																								
Oxytropis sericea																									
Paronychia sessiliflora																0.5									
Penstemon nitidus																									
Perideridia gairdneri				0.1																					
Petalostemon candidum																									
Petalostemon purpureum							0.3			0.1						0.1									
Phalaris arundinacea																									
Phlox hoodii							1.0	8.0	1.0	2.0			1.0			8.0	1.0				2.0	1.0			
Plantago major																									
Plantago patagonica																									
Poa canbyi																									
Poa cusickii																									
Poa juncifolia											3.0														
Poa pratensis				0.3										62.0										1.0	
Poa sandbergii									0.3													8.0			
Potentilla anserina																									
Potentilla palustris								0.5				0.1													
Salsola kali																									
Scirpus pungens																									
Selaginella densa																									
Senecio canus																									
Smilacina racemosa																									
Smilacina stellata																									
Solidago gigantea														15.0											
Solidago missouriensis				1.0																					
Sonchus arvensis																									
Sonchus sp.																									
Spartina gracilis																									
Sphaeralcea coccinea																					0.3	0.6	0.6		
Stipa comata			0.3			5.0	13.0	5.0	4.0	3.0			0.5			8.0	15.0		19.0		21.0	47.0	27.0		8.0
Stipa viridula			21.0										2.0			0.1	1.0								
Taraxacum officinale																									
Thalictrum venulosum																									
Thermopsis rhombifolia												1.0			1.0										
Thlaspi arvense																									
Tragopogon dubius																							0.1		
Unknown Cruciferae																									
Urtica dioica														2.0											
Vicia americana																									
X agrohordeum macounii																									
Lichen																									

Appendix I. **Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.**

Main Stratum/Species	P42	P43	P44	P45	P46	P47	P48	P49	P50	P51	P52	P53	P54	P55	P56	P57	P58	P59	P60	P61	P62	P63	P64	P65	P66
Tree Layer																									
Populus angustifolia																									
Populus angustifolia																									
Populus balsamifera																									
Populus deltoides																				60.0					
Populus x acuminata																									
Salix amygdaloides																									
Shrub Layer																									
Betula occidentalis																					80.0				
Cornus stolonifera								20.0																	
Prunus virginiana								60.0													10.0	70.0			
Salix lutea																									
Salix lutea																		40.0							
Shepherdia argentea																		20.0	80.0						
Amelanchier alnifolia								20.0																	
Artemisia cana											24.0										0.5				
Clematis ligusticifolia								2.0											0.5			2.0			
Cornus stolonifera																									
Elaeagnus commutata																									
Juniperus communis			46.0																		10.0				
Prunus virginiana																									
Rhus trilobata													59.0												
Ribes aureum																									
Ribes oxyacanthoides								10.0													1.0	1.0			
Rosa acicularis								10.0		3.0									5.0			3.0			
Rosa arkansana					0.1																				
Rosa woodsii																									
Salix exigua																									
Salix sp																									
Symphoricarpos occidentalis								25.0		57.0		15.0						5.0	5.0		2.0				2.0
Arctostaphylos uva-ursi																									
Artemisia cana			0.3			8.0	4.0																		
Chrysothamnus nauseosus	0.1						3.0																		
Gutierrezia sarothrae				3.0	5.0																				
Juniperus horizontalis												76.0													
Rhus radicans																					1.0				
Rhus trilobata			1.0																						
Ribes aureum																			2.0						
Rosa arkansana	0.3																								
Sarcobatus vermiculatus																									
Symphoricarpos occidentalis																									
Herb Layer																									
Achillea millefolium			0.1																		0.5				
Agropyron cristatum																									
Agropyron pectiniforme	3.0		0.3		3.0	18.0	21.0					0.7	2.0										2.0	30.0	
Agropyron smithii						8.0	11.0				1.0						31.0				15.0				26.0
Agropyron spp				4.0																					
Agrostis scabra																				15.0					
Allium textile																									
Alopecurus aequalis																									
Anemone multifida			0.3																						
Antenaria spp	0.3																								
Arctium minus								0.5												0.5		1.0			
Aristida purpurea var longiseta																									
Artemisia frigida	6.0	0.3			2.0	0.3					3.0						1.0						1.0		
Artemisia ludoviciana																								3.0	
Asclepias speciosa																									
Aster ericoides																									
Aster laevis																									
Astragalus flexuosus																									
Astragalus missouriensis																									
Astragalus pectinatus																									
Astragalus spp		0.3	0.3																						
Astragalus striatus																									
Atriplex argentea																									
Atriplex nuttallii																									
Atriplex spp				3.0																					
Bouteloua gracilis				1.0		1.0					0.5						2.0						55.0		
Bromus inermis																			0.5	2.0					
Bromus tectorum																		0.5							21.0
Calamagrostis inexpansa														85.0											
Calamagrostis montanensis																									
Calamovilfa longifolia	2.0		0.3		0.1							2.0	0.5											1.0	
Campanula rotundifolia												0.5													
Carex filifolia	33.0		3.0		2.0																			3.0	3.0
Carex heleonastes																									
Carex siccata									7.0																
Carex spp																									
Carex stenophylla						3.0						2.0													
Cerastium arvense																									
Cirsium arvense										40.0				15.0				0.5		2.0					
Comandra umbellata	0.1																							0.3	
Deschampsia cespitosa																									
Descurainia pinnata																						0.5			
Descurainia sophia																									
Distichlis stricta																									
Elymus canadensis								2.0																	
Elymus piperi																									
Elymus trachycaulus													2.0												
Elytrigia repens var repens																									
Equisetum arvense																			0.5	15.0					

Appendix I. Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.

Main Stratum/Species	P42	P43	P44	P45	P46	P47	P48	P49	P50	P51	P52	P53	P54	P55	P56	P57	P58	P59	P60	P61	P62	P63	P64	P65	P66
Erigeron caespitosus																									
Eriogonum flavum				0.1	0.3																				
Eriophorum gracile																									
Eurotia lanata				1.0																			1.0		
Festuca saximontana	0.3																								
Festuca scabrella												15.0													
Galium aparine																						0.5			
Galium boreale																					0.5				
Gaura coccinea																									1.0
Geum triflorum																									
Glycyrrhiza lepidota																									
Grindelia squarrosa				0.3																					
Helianthus annuus																									
Helianthus nuttallii														15.0											
Heracleum lanatum																									
Hesperis matronalis																									
Heterotheca villosa	0.1																								0.3
Hordeum jubatum																				0.5					
Hymenoxys acaulis			0.3																						
Hymenoxys richardsonii				0.5																					
Iva axillaris				2.0																					
Iva xanthifolia																		37.0							
Juncus balticus									5.0																
Juncus stygius												15.0													
Koeleria macrantha	7.0		0.1								1.0						5.0				0.5			17.0	
Lappula squarrosa								2.0														0.5			
Liatris punctata	0.3																							1.0	
Linum lewisii			0.3																						
Linum rigidum																									
Lithospermum incisum		0.5				0.1																			
Lithospermum ruderale																									
Lygodesmia juncea																									0.8
Melilotus alba																		0.5		0.5	2.0				
Melilotus officinalis																				0.5					
Mentha arvensis														37.0	30.0										
Monarda fistulosa								0.5														0.5			
Muhlenbergia cuspidata					24.0																			1.0	
Nepeta cataria																		0.5		0.5		0.5			
Oenothera biennis																				0.5					
Opuntia polyacantha																									
Oryzopsis hymenoides		32.0																							
Oxytropis sericea																									
Paronychia sessiliflora	0.5																								
Penstemon nitidus																									
Perideridia gairdneri																									
Petalostemon candidum																									
Petalostemon purpureum																									
Phalaris arundinacea																85.0				0.5					
Phlox hoodii	0.3		0.3	0.3	1.0																			2.0	
Plantago major																				0.5					
Plantago patagonica											0.5														
Poa canbyi																									2.0
Poa cusickii							9.0																		
Poa juncifolia																									
Poa pratensis								2.0		14.0											15.0	0.5			
Poa sandbergii		1.0				0.5					2.0		0.5				2.0						20.0	3.0	
Potentilla anserina									2.0					15.0											
Potentilla palustris																									
Salsola kali		0.1																							
Scirpus pungens									44.0						85.0										
Selaginella densa	1.0																							8.0	
Senecio canus																									
Smilacina racemosa																						0.5			
Smilacina stellata																					0.5	0.5			
Solidago gigantea								0.5																	
Solidago missouriensis																									
Sonchus arvensis																				0.5					
Sonchus sp																									
Spartina gracilis									0.1																
Sphaeralcea coccinea		2.0					1.0				2.0												2.0		
Stipa comata	7.0	19.0		2.0	7.0	36.0	0.4				57.0		6.0				55.0							3.0	20.0
Stipa viridula						0.3	3.0																		
Taraxacum officinale																			0.5						
Thalictrum venulosum								0.5		0.3											0.5	0.5			
Thermopsis rhombifolia			1.0									0.5												2.0	
Thlaspi arvense																		0.5							
Tragopogon dubius											2.0													0.5	
Unknown Cruciferae																									
Urtica dioica																		37.0				0.5			
Vicia americana																									
X agrohordeum macounii									0.1																
Lichen	15.0																							1.0	

Appendix I. **Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.**

Main Stratum/Species	P68	P69	P70	P71	P72	P73	P74	P75	P76	P77	P78	P79	P80	P81	P82	P83	P84	P85	P86	P87	P88	P89
Tree Layer																						
Populus angustifolia																						
Populus angustifolia										30.0												
Populus balsamifera	15.0																					
Populus deltoides																						
Populus x acuminata																		20.0				
Salix amygdaloides											5.0											
Shrub Layer																						
Betula occidentalis	5.0										4.0											
Cornus stolonifera	1.0									10.0												
Prunus virginiana	5.0									5.0								4.0				
Salix lutea											10.0											
Salix lutea																						
Shepherdia argentea										1.0												
Amelanchier alnifolia	1.0									10.0		80.0						10.0		30.0		
Artemisia cana																			4.0			
Clematis ligusticifolia	0.5									0.5	0.5	2.0										
Cornus stolonifera																		2.0				
Elaeagnus commutata																			32.0			
Juniperus communis	3.0					2.0												1.0				
Prunus virginiana												5.0										
Rhus trilobata	1.0									1.0								3.0				
Ribes aureum										1.0	1.0									5.0		
Ribes oxyacanthoides																						
Rosa acicularis	1.0										1.0							1.0	1.0			
Rosa arkansana																						
Rosa woodsii																						
Salix exigua																					3.0	
Salix sp																						
Symphoricarpos occidentalis	5.0										5.0		57.0					15.0	7.0	20.0		2.0
Arctostaphylos uva-ursi						62.0																
Artemisia cana																						
Chrysothamnus nauseosus																						15.0
Gutierrezia sarothrae																						10.0
Juniperus horizontalis						15.0																
Rhus radicans																				85.0		
Rhus trilobata																						
Ribes aureum	1.0											1.0						1.0		5.0		
Rosa arkansana																						
Sarcobatus vermiculatus																						
Symphoricarpos occidentalis										1.0												
Herb Layer																						
Achillea millefolium	0.5					0.5												0.5				
Agropyron cristatum																						
Agropyron pectiniforme																						
Agropyron smithii						2.0			0.3								35.0	2.0			62.0	8.0
Agropyron spp																						
Agrostis scabra																						
Allium textile																						
Alopecurus aequalis		62.0																				
Anemone multifida																						
Antenaria spp																						
Arctium minus																						
Aristida purpurea var longiseta																						
Artemisia frigida										0.5				0.1	10.0	3.0	3.0					1.0
Artemisia ludoviciana																						
Asclepias speciosa			15.0																			
Aster ericoides			2.0																			
Aster laevis										0.5			0.1					0.5	0.3			
Astragalus flexuosus																						
Astragalus missouriensis																						1.0
Astragalus pectinatus																						
Astragalus spp																						
Astragalus striatus																						
Atriplex argentea																						
Atriplex nuttallii																						3.0
Atriplex spp																						
Bouteloua gracilis														69.0	28.0	60.0	16.0					
Bromus inermis								2.0		0.5								15.0				
Bromus tectorum																14.0						
Calamagrostis inexpansa																						
Calamagrostis montanensis																						
Calamovilfa longifolia										0.5												
Campanula rotundifolia																						
Carex filifolia																						
Carex heleonastes																						
Carex siccata																						
Carex spp																						
Carex stenophylla																						
Cerastium arvense																						
Cirsium arvense							15.0				0.5		1.0									
Comandra umbellata						0.5																
Deschampsia cespitosa	0.5																				0.5	
Descurainia pinnata																						
Descurainia sophia																						
Distichlis stricta									31.0													3.0
Elymus canadensis	0.5										0.5											
Elymus piperi																		0.5				
Elymus trachycaulus	0.5			62.0						0.5	0.5	2.0	36.0						17.0	15.0		
Elytrigia repens var repens																						
Equisetum arvense																						

Appendix I. **Plant species list, with percent cover by plot, for plots completed in Writing-on-Stone Provincial Park.**

Main Stratum/Species	P68	P69	P70	P71	P72	P73	P74	P75	P76	P77	P78	P79	P80	P81	P82	P83	P84	P85	P86	P87	P88	P89
Erigeron caespitosus																						
Eriogonum flavum						2.0																
Eriophorum gracile																						
Eurotia lanata																						
Festuca saximontana																						
Festuca scabrella																						
Galium aparine																						
Galium boreale																						
Gaura coccinea																						
Geum triflorum															0.3							
Glycyrrhiza lepidota		15.0		62.0																	2.0	
Grindelia squarrosa																			0.1			
Helianthus annuus																						
Helianthus nuttallii		15.0			85.0																	
Heracleum lanatum																						
Hesperis matronalis																						
Heterotheca villosa												0.5										
Hordeum jubatum			15.0	15.0				85.0													2.0	
Hymenoxys acaulis						15.0																
Hymenoxys richardsonii																						
Iva axillaris									14.0													
Iva xanthifolia																						
Juncus balticus							62.0															
Juncus stygius						15.0				0.5												
Koeleria macrantha						2.0				0.5									1.0			17.0
Lappula squarrosa																						
Liatris punctata																						
Linum lewisii																						
Linum rigidum																						
Lithospermum incisum																						
Lithospermum ruderale																						
Lygodesmia juncea															0.3							
Melilotus alba																						
Melilotus officinalis										0.5												
Mentha arvensis																						
Monarda fistulosa																		0.5				
Muhlenbergia cuspidata																						
Nepeta cataria																						
Oenothera biennis																						
Opuntia polyacantha																						
Oryzopsis hymenoides																						
Oxytropis sericea																						
Paronychia sessiliflora																						
Penstemon nitidus																						
Perideridia gairdneri																						
Petalostemon candidum																						
Petalostemon purpureum																						
Phalaris arundinacea								15.0														
Phlox hoodii																						6.0
Plantago major																						
Plantago patagonica															0.3	0.5						
Poa canbyi																						
Poa cusickii																						
Poa juncifolia																						
Poa pratensis	2.0						0.5				0.5		28.0					15.0		15.0		
Poa sandbergii														14.0	1.0	0.3						
Potentilla anserina																						
Potentilla palustris																						
Salsola kali																						
Scirpus pungens					15.0																	
Selaginella densa																						
Senecio canus																						
Smilacina racemosa																						
Smilacina stellata	0.5									0.5		2.0						0.5				
Solidago gigantea	15.0				15.0					0.5												
Solidago missouriensis										0.5	0.5							0.5				
Sonchus arvensis		15.0					15.0	15.0														
Sonchus sp.																						
Spartina gracilis																						
Sphaeralcea coccinea														3.0	5.0	2.0	3.0					
Stipa comata										0.5				2.0	16.0	0.3						
Stipa viridula	0.5												3.0					2.0				
Taraxacum officinale																						
Thalictrum venulosum	0.5																	0.5				
Thermopsis rhombifolia										0.5												
Thlaspi arvense																						
Tragopogon dubius										0.5				1.0			1.0					
Unknown Cruciferae																						
Urtica dioica																						
Vicia americana																						
X agrohordeum macounii			62.0	2.0																		
Lichen																						

Appendix II. List of Plant Community Types identified by Cornish (1996) with relative importance in coulee and riparian habitats.

Plant Community Type	Habitat Affiliation	Importance	Equivalent Type/Notes
(1) Needle-and-thread – Wheat grass	Uplands Riparian Terrace	Common Less common	*Stipa comata* - *Pascopyrum smithii* – *Koeleria macrantha* Herbaceous Vegetation
(2) Blue grama – Needle-and-thread	Upland Stable coulee & badland slopes	Common Less common	*Bouteloua gracilis* - *Stipa comata* Herbaceous Vegetation common in overgrazed areas
(3) Wheat grass – Needle-and-thread – Downy chess	Uplands Riparian Terraces	Fairly common Common	*Pascopyrum smithii* - *Stipa comata* – *Bromus tectorum* Herbaceous Vegetation
(4) Western wheat grass (eroded pits) & Wheat grass – Bluegrass (hummocks) Complex	Uplands	Fairly common	*Pascopyrum smithii* Herbaceous Vegetation is equivalent to Western wheat grass (eroded pits)
(5) Green needle grass – Northern wheat grass – Bluegrass	Upland	Less common	Not sampled
(6) Wheat grass – Junegrass	Upland	Common	*Elymus lanceolatus* – *Stipa comata* Herbaceous Vegetation
(7) Upland Ephemeral Wetlands	Upland Wetland	Less common	Not sampled
(8) Choke cherry – Waterbirch – Buckbrush / Bluegrass – Giant wild rye	Riparian	Variable depending on type	Includes one *Betula occidentalis* and two *Symphoricarpos occidentalis* types.
(9) Milk River Floodplain / Mixed Shrubland	Riparian	Variable depending on type	Generalized type divided into a number of willow and non-willow community types
(10) Silver sagebrush / Forbs / Needle-and-thread – Wheat grass	Coulees Riparian Terrace	Common Less common	*Artemisia cana* / *Stipa viridula* - *Pascopyrum smithii* Shrubland
(11) Greasewood – Silver sagebrush / Forbs / Wheat grass	Badlands Coulees	Common Common	Generalised type but generally equivalent to *Sarcobatus vermiculatus* - *Atriplex nuttallii* / *Distichlis stricta* Dwarf-shrubland
(12) Cottonwood / Choke cherry / Bluegrass	Riparian	Variable depending on type	Scattered groves; generalized type divided into 4 previously described community types and one previously undescribed type
(13) Wheat grass – cultivars (reclaimed cultivated areas)	Upland	Unknown	Not sampled.

Appendix III. Correlation table of plant community types for the Mixedgrass and Dry Mixedgrass Natural Subregions with Similarity Ratings (After Corns 1983, Strong 2002).

Section	Classification	Plot	Other Sources	Similarity
3.2 EXISTING CLASSIFICATIONS 3.2.1 WOODLAND				
3.2.1.1	*Populus deltoides / Glycrrhiza lepidota* Woodland	61	*Populus deltoides*/Herbaceous Community Type (Thompson and Hansen 2002) *Populus deltoides*/recent alluvial (Allen 2003)	1 2/3
3.2.1.2	*Populus angustifolia / Symphoricarpos occidentalis* Woodland	1	*Populus angustifolia/Symphoricarpos occidentalis* Type (Thompson and Hansen 2002) *Populus angustifolia/Symphoricarpos occidentalis* (Allen 2003) Cottonwood/Choke cherry/Bluegrass (Cornish 1996)	1 1 3
3.2.1.3	*Populus angustifolia / Cornus sericea* Woodland	77	*Populus angustifolia / Cornus stolonifera* Woodland (Thompson and Hansen 2002) *Populus angustifolia / Cornus stolonifera* Woodland (Allen 2003) Cottonwood/Choke cherry/Bluegrass (Cornish 1996)	2 2 3
3.2.1.4	*Populus balsamifera / Symphoricarpos occidentalis* Woodland	68	*Populus balsamifera/Symphoricarpos occidentalis* Type (Thompson and Hansen 2002) Cottonwood/Choke cherry/Bluegrass (Cornish 1996)	1 3
3.2.2 SHRUBLAND				
3.2.2.1	*Betula occidentalis* Shrubland	62	*Betula occidentalis* Community Type (Thompson and Hansen 2002) Choke cherry-Water Birch-Buckbrush/bluegrass–giantwild rye (Cornish 1996) *Betula occidentalis* Shrubland (Allen 2003)	2 3 2
3.2.2.2	*Shepherdia argentea* Shrubland	60	*Shepherdia argentea* Community Type(Thompson and Hansen 2002)	2
3.2.2.3	*Elaeagnus commutata* Shrubland	86	*Elaeagnus commutata* Community Type (Thompson and Hansen 2002) *Elaeagnus commutata / Pascopyrum smithii* Shrubland (Allen 2003)	2 3
3.2.2.4	*Prunus virginiana* Shrubland	3,49,63	*Prunus Virginiana* Choke Cherry Community Type (Thompson and Hansen 2002) Choke cherry-Water Birch-Buckbrush/bluegrass–giantwild rye (Cornish 1996)	2 3
3.2.2.5	*Amelanchier alnifolia* Shrubland	79	*Amelanchier alnifolia* Shrubland (NatureServe 2003)	2
3.2.2.6	*Arctostaphylos uva-ursi* Dwarf-shrubland	73	*Arctostaphylos uva-ursi* Dwarf-shrubland (Wheatley and Bentz 2002)	2
3.2.2.7	*Salix exigua* Shrubland	30	*Salix exigua* Community Type (Thompson and Hansen 2002)	2
3.2.2.8	*Salix amygdaloides* Shrubland	78	*Salix amygdaloides* Shrubland (Allen 2003) *Salix amygdaloides* Community Type (Thompson and Hansen 2002)	2 2
3.2.2.9	*Salix lutea / Cornus sericea* Shrubland	59	*Salix lutea/Cornus stolonifera* Habitat Type (Thompson and Hansen 2002) *Salix lutea / Cornus stolonifera* Shrubland (Allen 2003)	2 2
3.2.2.10	*Symphoricarpos occidentalis* Shrubland	40,51, 80	*Symphoricarpos occidentalis* Community Type (Thompson and Hansen 2002) Choke cherry-Water Birch-Buckbrush/bluegrass–giantwild rye (Cornish 1996)	1 3

Appendix III. Continued.

3.2.3 HERBACEOUS VEGETATION				
3.2.3.1	*Artemisia cana / Stipa viridula - Pascopyrum smithii* Shrubland	5,19	Silver sagebrush/Forbs/Needle-and-thread-Wheat grass (Cornish 1996) *Artemisia cana / Stipa viridula - Pascopyrum smithii* Shrubland (Allen 2003) *Artemisia cana / Pascopyrum smithii* Shrub Herbaceous (Adams et al. 2002) *Artemisia cana / Stipa viridula - Pascopyrum smithii* Shrubland (Weerstra 2001) *Artemisia cana / Pascopyrum smithii* (Thompson and Hansen 2002)	2/3 1? 2 1 2
3.2.3.2	*Artemisia cana / Hesperostipa comata* Shrubland	47,52	*Sarcobatus vermiculatus/Agropyron smithii* Type (Thompson and Hansen 2002) *Artemisia cana / Stipa comata* Shrubland (Allen 2003) *Artemisia cana / Stipa comata* Shrub Prairie (Weerstra 2001)	2/3 1 1
3.2.3.3	*Phalaris arundinacea* Herbaceous Vegetation	57	*Phalaris arundinacea* Reed Canary Grass Habitat Type (Thompson and Hansen 2002)	1
3.2.3.4	*Calamagrostis stricta - Calamagrostis inexpansa* Herbaceous Vegetation	55	*Calamagrostis stricta-C. inexpansa* (Thompson and Hansen 2002)	1
3.2.3.5	*Glycyrrhiza lepidota* Herbaceous Vegetation	6	*Glycyrrhiza lepidota* Community Type (Thompson and Hansen 2002)	2/1
3.2.3.6	*Hordeum jubatum* Herbaceous Vegetation	75	*Hordeum jubatum* Community Type (Thompson and Hansen 2002)	2
3.2.3.7	*Schoenoplectus pungens* Herbaceous Vegetation	50,56	*Scirpus pungens* Community Type (Thompson and Hansen 2002)	1
3.2.3.8	*Juncus balticus* Herbaceous Vegetation	74	*Juncus balticus* Community Type (Thompson and Hansen 2002)	1
3.2.3.9	*Calamovilfa longifolia - Hesperostipa comata* Herbaceous Vegetation	9,12,41	*Calamovilfa longifolia - Stipa comata* Herbaceous Vegetation (Allen 2003)	2
3.2.3.10	*Pascopyrum smithii – Bouteloua gracilis* Herbaceous Vegetation	84	*Pascopyrum smithii – Bouteloua gracilis* Herbaceous Vegetation (Allen 2003) *Pascopyrum smithii – Bouteloua gracilis* Herbaceous Veg. (Vujnovic and Bentz 2001)	1 2
3.2.3.11	*Pascopyrum smithii - Hesperostipa comata – Bromus tectorum* Herbaceous Vegetation	66	*Pascopyrum smithii - Stipa comata – Bromus tectorum* (Cornish 1996) *Pascopyrum smithii-Stipa comata- Boutelloua gracilis* Herbaceous (Allen 2003)	1/2 2
3.2.3.12	*Pascopyrum smithii* Herbaceous Vegetation	2	*Pascopyrum smithii* (Eroded Pits Type) (Cornish 1996) *Pascopyrum smithii* Herbaceous Vegetation (Vujnovic and Bentz 2001)	2 1
3.2.3.13	*Pascopyrum smithii – Glycyrrhiza lepidota* Herbaceous Vegetation	88	*Agropyron smithii* Habitat Type (Thompson and Hansen 2002)	1/2
3.2.3.14	*Hesperostipa comata - Bouteloua gracilis* Herbaceous Vegetation	39,82	*Bouteloua gracilis - Stipa comata* (Cornish 1996) *Stipa comata - Bouteloua gracilis* Community (Gerling et al. 1996)	1 2
3.2.3.15	*Hesperostipa comata - Pascopyrum smithii – (Poa sandbergii)* Herbaceous Vegetation	38,58	*Stipa comata-Pascopyrum smithii* Herbaceous Vegetation (Allen 2003) *Stipa comata-Pascopyrum smithii* (Cornish 1996) *Stipa comata-Koeleria macrantha-Pascopyrum smithii* Herb. (Wheatley and Bentz 2002)	3/2 2/3 3/2
3.2.3.16	*Elymus lanceolatus – Pascopyrum smithii* Herbaceous Vegetation	48	*Elymus lanceolatus – Pascopyrum smithii* Herbaceous Vegetation (Allen 2003) *Elymus lanceolatus – Pascopyrum smithii* Herbaceous Veg. (Vujnovic and Bentz 2001)	1 1
3.2.3.17	*Elymus lanceolatus – Hesperostipa comata* Herbaceous Vegetation	65	*Elymus lanceolatus – Stipa comata* Herbaceous Vegetation (Allen 2003) Wheat grass - *Koeleria macrantha* (Cornish 1996) *Elymus lanceolatus – Stipa comata* Herbaceous Vegetation (Vujnovic and Bentz 2001) *Stipa comata - Elymus lanceolatus* (Gerling et al 1996)	1 2 1 2
3.2.3.18	*Elymus trachycaulus* Herbaceous Vegetation	71	*Elymus trachycaulus* Herbaceous Vegetation (Vujnovic and Bentz 2001)	2

Appendix III. Continued.

3.3 TENTATIVE CLASSIFICATIONS 3.3.1 WOODLAND				
3.3.1.1	*Populus x acuminata / Symphoricarpos occidentalis* Woodland	85		
3.3.2 SHRUBLAND				
3.3.2.1	*Sarcobatus vermiculatus - Atriplex nuttallii / Distichlis stricta* Dwarf-shrubland	11,14,17,21,27	Greasewood- Silver sagebrush/Forbs/Wheat grass (Cornish 1996) *Sarcobatus vermiculatus - Pascopyrum smithii* Dwarf-shrubland (Allen 2003)	3 3
3.3.2.2	*Ericameria nauseosus - Gutierrezia sarothrae / Koeleria macrantha* Dwarf-shrubland	89		
3.3.2.3	*Rhus radicans* Shrubland	87		
3.3.2.4	*Rhus trilobata - Artemisia cana / Stipa comata* Shrubland	29,35,54		
3.3.2.5	*Symphoricarpos occidentalis / Elymus piperi* Shrubland	7,15,16	Choke cherry-Water Birch-Buckbrush/bluegrass–giantwild rye (Cornish 1996)	3
3.3.2.6	*Juniperus communis - Artemisia cana* Shrubland	4,28,31,44		
3.3.2.7	*Juniperus horizontalis – (Festuca scabrella)* Dwarf-shrubland	53	*Festuca hallii-Koeleria macrantha-Juniperus horizontalis*-Forbs Herbaceous(Allen 2003) *Juniperus horizontalis/Koeleria macrantha-Eriogonum flavum* Herbaceous (Allen 2003)	3? 2?
3.3.3 HERBACEOUS VEGETATION				
3.3.3.1	*Festuca scabrella* Herbaceous Vegetation	8,10,20	*Festuca hallii* Herbaceous Vegetation (Allen 2003) *Festuca campestris - Artemisia frigida - Festuca idahoensis* Herbaceous (Adams et. al (2003)	3/2 2?
3.3.3.2	*Alopecurus aequalis - Glycyrrhiza lepidota - Helianthus nuttallii* Herbaceous Vegetation	69		
3.3.3.3	*X Agrohordeum* Herbaceous Vegetation	70		
3.3.3.4	*Helianthus nuttallii* Herbaceous Vegetation	72		
3.3.3.5	*Distichlis stricta - Iva axillaris* Herbaceous Vegetation	76		
3.3.3.6	*Bouteloua gracilis – Poa sandbergii* Herbaceous Vegetation	64,81,83		
3.3.3.7	*Krascheninnikovia lanata - Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation	13,22,33		
3.3.3.8	*Hesperostipa* comata - *Aristida longiseta - Carex filifolia* Herbaceous Vegetation	23,24,37,42		
3.3.3.9	*Achnatherum hymenoides - Hesperostipa comata* Herbaceous Vegetation	43		
3.3.3.10	*Distichlis stricta – (Koeleria macrantha) – (Stipa viridula)* Herbaceous Vegetation	26	*Distichlis stricta* Community Type (Thompson and Hansen 2002)	3
3.3.3.11	*Muhlenbergia cuspidata / Hesperostipa comata* Herbaceous Vegetation	25,32,46		
3.3.4 SPARSE VEGETATION				
3.3.4.1	*Distichlis stricta - Gutierrezia sarothrae* Badlands Sparse Vegetation	18,34,36,45		

Similarity Rating: 1) Identical or very similar 2) Similar in most respects 3) several similarities but important differences